

ACTA RADIOLOGICA

SUPPLEMENTUM 361

ÅKE GULLMO

HERNIOGRAPHY

The diagnosis of hernia in the groin and incompetence of
the pouch of Douglas and pelvic floor

Lund 1980

STOCKHOLM 1980

This volume which forms
Supplementum 361 to Acta Radiologica, may be obtained from
ACTA RADIOLOGICA, P. O. Box 7449, S-103 91 Stockholm, Sweden
or the usual agents.

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Acta Radiologica

ISSN 0365-5954



Printed in Sweden by
Almqvist & Wiksell, Uppsala 1980

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INTRODUCTION

In a discussion on phlebography of the lower limb a special notice of the strain obstruction syndrome of the femoral vein was made (GULLMO 1956). Later it was shown that obstruction and compression could be caused by an incipient femoral hernia on the medial side of the vein (GULLMO 1957). In some cases operation disclosed a lipoma in the femoral canal with a potential compressive effect on the vein. Another regular finding at operation was an apparent laxity of the fascial structures medially to the femoral vein. MCVAY & ANSON (1949) described an appropriate hernioplastic method which emphasized restitution of the fascial surroundings of the femoral canal on the medial side of the vein. When this method was adopted in this hospital, postoperative examinations revealed that the compression was alleviated which resulted in almost normal appearance of the vein. Postoperative phlebography became a test of the effectiveness of the hernioplasty.

The phlebographic test was used for some years sporadically on patients with obscure symptoms in the groins. Operation in cases with typical compression of the femoral vein regularly revealed abnormalities in the femoral canal. Additionally two cases of emergency operation for strangulated femoral hernia were encountered. At previous phlebography for varicose veins the compression phenomenon was present in both cases. These cases were not operated upon until strangulation occurred. In order to assess the pathologic validity of the compression phenomenon and its occurrence in patients without symptoms in the groins, the phlebographic test was carried out bilaterally in a prospective series of patients when contrast medium was injected for urography. Compression rarely occurred in young people but with advancing age it was found with increasing frequency.

With the introduction of the new contrast media of the meglumine metrizoate or metrizamide type it was possible to carry out direct herniography without inconveniences to the patients. Herniography has been performed routinely in this department since July 1972. Special interest was at first directed to cases with the compression phenomenon of the femoral vein present at phlebography. Herniography was soon found to be of value also in patients with

obscure symptoms in the groins. It is therefore now requested with increasing frequency. With this direct method it is always possible to determine the presence or absence of hernia and also the type of hernia if present. In many cases additional incipient hernias are found which at operation can be appropriately corrected and so-called recurrences prevented.

The series consisted of adult patients. The technique and adequate result of the examination demands good cooperation by the patient.

1. PREVIOUS INVESTIGATIONS

Indirect herniography

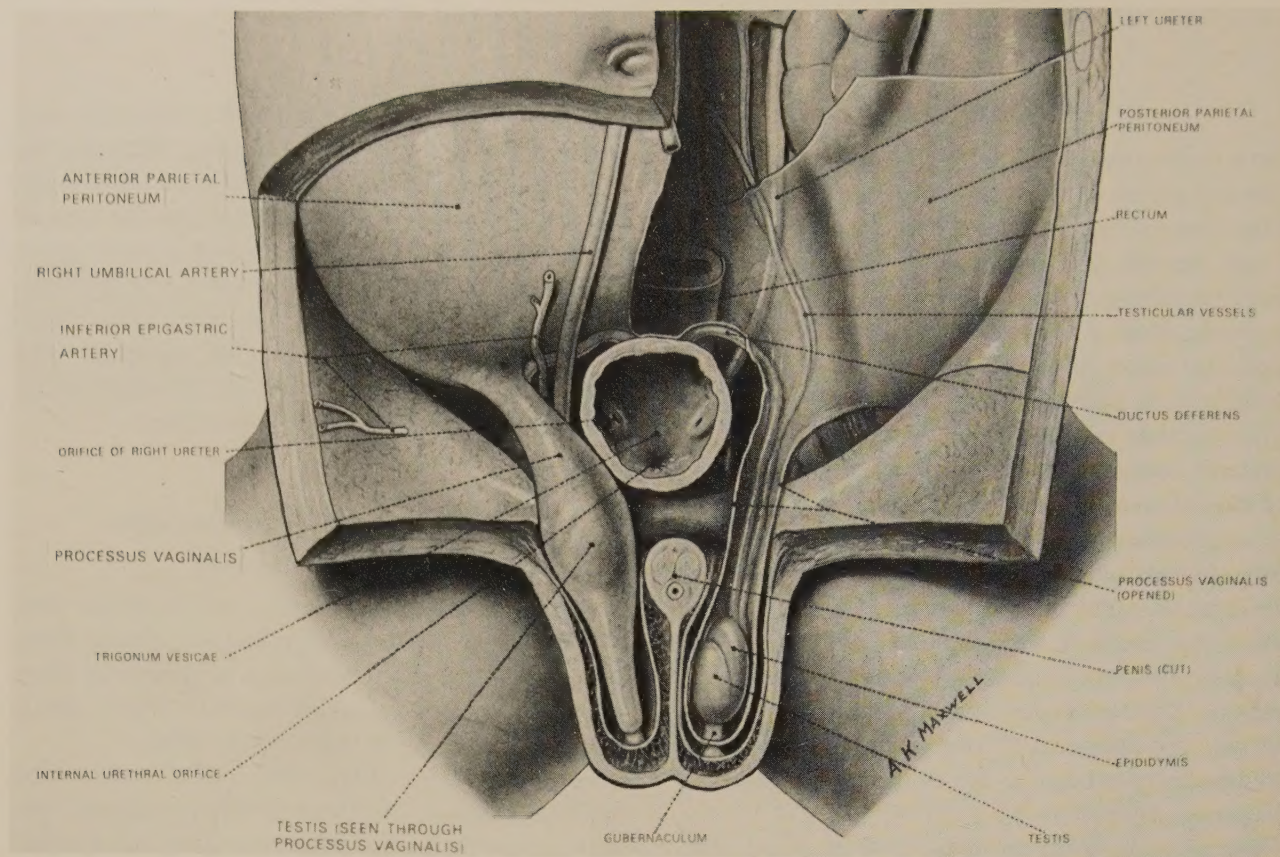
LAURELL (1929) published a review of the possibilities of hernia diagnosis based on contrast filling of the digestive tract. Spigelian hernias were demonstrated with this method by READ (1960), BRYK (1967) and HOLDER & SCHNEIDER (1974).

FRIMANN-DAHL (1951, 1968, 1974) emphasized the importance of gas-filled viscera outside the normal boundaries of the abdominal cavity in examinations of acute abdominal disease.

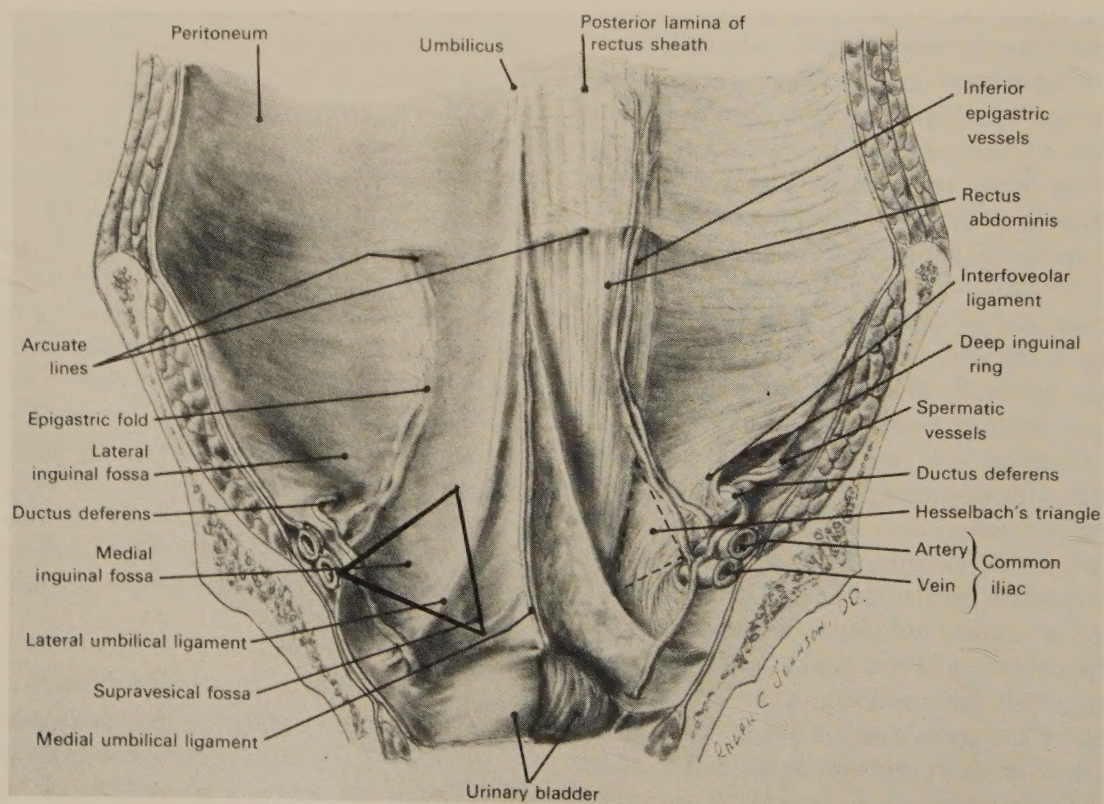
Deviation of contrast-filled ureters into hernias was first reported by LINDBOM (1947) in a case of sciatic hernia. Similar cases were reported by BECK et coll. (1952), BOHNERT (1971) and LEBOWITZ (1973). Some of these patients were children with myelomeningocele and reduced muscle volume in the pelvis and gluteal region. FRANKEN & SMITH (1969) and ROTHCHILD (1969) published one case each of sciatic hernia in which the preoperative diagnosis resulted from ureter deviation into a supposed femoral hernia. Ureter deviations into hernias were summarized by POLLACK et coll. (1975). ALLEN & CONDON (1961) described lateral protrusions of the urinary bladder into the deep inguinal ring ('bladder ears') in 9 per cent of 406 urographies performed on infants less than twelve months of age. An unusual case with a large part of the stomach protruding into an inguinal hernia was published by CHRISTENSEN (1979).

Attempts at direct herniography

ARNER & FERNSTRÖM (1970) described a method of gas filling of hernias in the groin using pneumoperitoneum. However, this method was very uncomfortable to the patient, who had to be placed in



a



b

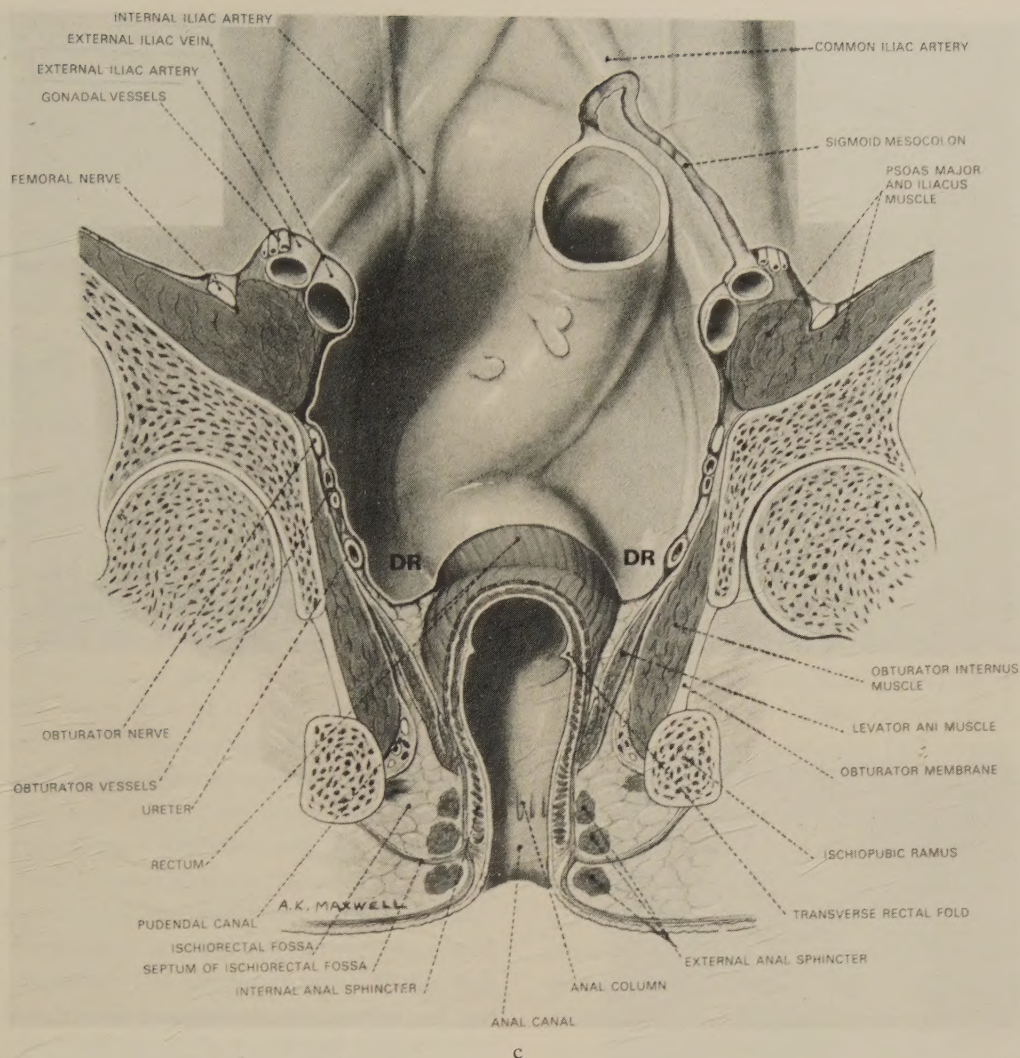


Fig. 1. a) Drawing of dissection of male fetus near full term showing descent of testis and formation of processus vaginalis. On right side testis at earlier stage of descent than on left. Right umbilical artery will later be lateral umbilical ligament and fold. Inferior epigastric artery will appear as epigastric fold and always on medial side of eventual lateral indirect hernia which in early stages has form of processus vaginalis. b) Internal aspect of lower ventral body wall. On left, peritoneum removed to show transversalis fascia in inguinal region. Hesselbach's triangle usually considered also to include lateral half of supravesical fossa

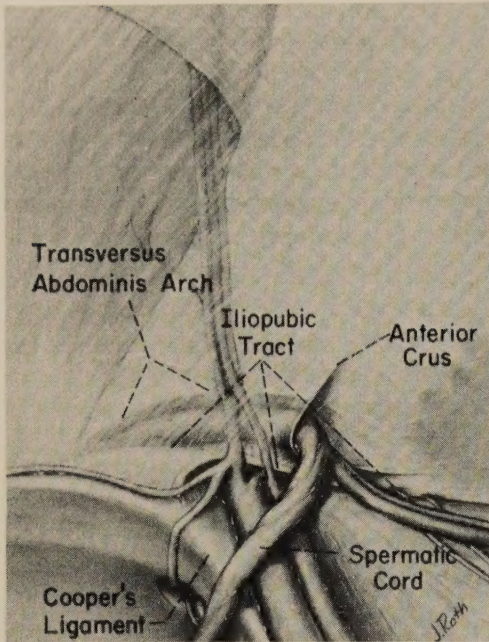
which is second emergence site of direct hernias. Correction made on right side. (Fig. 1b reproduced by permission from BECKER et coll.: *The anatomical basis of medical practice*. Williams & Wilkins Co, Baltimore 1971.) c) Drawing of posterior part of pouch of Douglas and its recesses (DR) lateral to rectum in which contrast medium collects in supine position during injection. (Fig. 1a and c are by permission reproduced from HAMILTON: *Textbook of human anatomy*. Second edition. Macmillan, London, Basingstoke 1976.)

difficult positions for satisfactory air filling of the inguinal regions. Incipient and small hernias could not be diagnosed with this method.

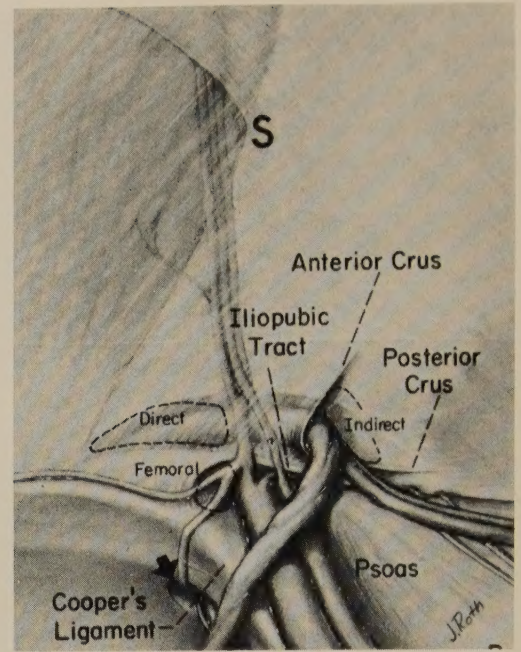
Peritoneography using positive contrast medium was first performed in animal experiments by STERNHILL & SCHWARTZ (1960), BIRZLE (1961) and ALMOND et coll. (1961). Contrast medium of the old sodiumsalt type was used and at following microscopic examination a slight inflammatory reaction was noted on the serosal surfaces. In similar investigations with iothalamic acid and its methylglucamine

salt (Angio-Conray) by MARGULIS et coll. (1963) and with meglumine diatrizoate (Renografin-60) by MEYERS (1973), no peritoneal reaction was found.

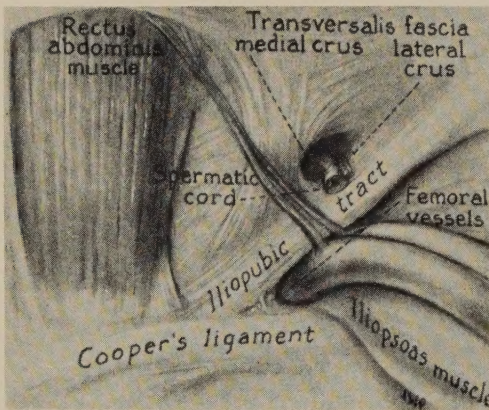
Herniography in clinical use was performed in small series on infants and children by DUCHARME et coll. (1967), WHITE et coll. (1968), SWISCHUK et coll. (1971), JAMES (1971), SHACKELFORD & MCALLISTER (1972), OH et coll. (1973) and BLAU et coll. (1973). No adverse reactions were reported in spite of frequent perforation of intestinal loops. Some of these authors indicated that the method



a



b



c

Fig. 2. a, b) Most important anatomic structures connected with common groin hernias. At arrow emergence site of obturator hernia. Spigelian hernia emerges through fascial triangle at S. (Reproduced by permission from NYHUS & CONDON: *Hernia*. Second edition. Lippincott, Philadelphia 1978.) c) Drawing of normal transversalis fascia structures in emergence sites of inguinal and femoral hernias. (From NYHUS et coll. 1960.)

could be used on adult patients but they supposed it to be of minor importance as the clinical diagnosis of hernia was considered sufficient.

DETRIE et coll. (1973) described a series of herniography on 20 adult patients using methylglucamine ioxithalamate (Telebrix, Guerbet). The results were not described in detail, the purpose mainly being to detect recurrent hernias. The authors observed large hernial sacs which could not be palpated at clinical examination. It was noted that direct hernias could also have a well marked hernial sac. These authors used straight postero-anterior projections only and the hernial regions were therefore often superimposed by a contrast-filled pouch of Douglas.

Further experience with herniography on children was reported by JEWETT et coll. (1976), RIDDELSBERGER (1978) and REEVES & LONGERBEAM (1978). Editorial comments on herniography were presented in *Surgery* by LEAPE (1978) and WHITE (1978). LEAPE considered the procedure to be of no value in the treatment of hernia in children and he went so far as to conclude that 'its use must be condemned'. WHITE, on the other hand, was of the opinion, after 10 years of use, that it was a valuable adjunct in selecting optimum management for children with suggested but not palpable hernias or with one-sided hernia.

In a report by OH et coll. (1978), 4 cases with femoral hernia were diagnosed at herniography.

Three cases were young boys and one was a 24-year-old dwarf woman. These hernias were considered to be of congenital nature. The authors had also observed transient small hernias in the region of the femoral canal, which possibly were incipient femoral hernias.

A case of anterior perineal hernia (labial hernia) diagnosed with intraperitoneal injection of contrast medium was described by BERG (1979).

2. ANATOMY AND CLINICAL CONSIDERATIONS

Herniography is in principle based on the appropriate positioning of the patient so that gravitational pooling of a relatively heavy positive contrast medium occurs in the most common hernial regions. With a small amount of contrast medium the inner surface of the lower part of the anterior abdominal wall and the pelvic floor are examined in succession. The peritoneal surfaces are demonstrated according to general radiologic principles, using tangential and en face projections. Hernias are by definition peritoneal pouchings through weak or ruptured structures in the musculo-fascial wall of the abdominal cavity. Beginning or incipient hernias therefore first appear as defects in the inner layer of the wall which in the inguinal region is composed of the transversus abdominis aponeurosis and fascia.

In old surgical methods for hernial repair the interest was directed mainly to the outer muscle layer, the external oblique muscle with its lower tendinous border, the inguinal ligament (Bassini method). However, also early descriptions of methods directed to the inner transversus layer have been published (MARCY 1871, LOTHEISSEN 1898, HARRISON 1922). After fundamental anatomic investigations by ANSON & MCVAY (1938) a method for special reinforcement of the transversus layer was adopted and named after MCVAY. The repair was made by an inguinal approach from below. During the past two decades an approach from above has been recommended by NYHUS et coll., the preperitoneal approach. The internal anatomic structures of the hernial regions are instructively illustrated by NYHUS et coll. (Figs 2, 3).

The topographic anatomy of these regions are well described in the common textbooks of anatomy, i.e. HAFFERL (1953), Gray's Anatomy

(35th edition 1973), HOLLINSHEAD (1971, 1974), BECKER et coll. (1971; Fig. 1 b), ANSON & MCVAY (1971), HAMILTON (2nd edition 1976; Fig. 1 a, c), GARDNER et coll. (1975).

The most common of all hernias, the indirect lateral, is of congenital nature and its prerequisites are illustrated in Fig. 1 a, in which also the fetal umbilical artery is visible. The fibrous rest of this artery in adult life constitutes the lateral umbilical ligament (Fig. 1 b) appearing as the lateral umbilical fold. Indirect inguinal hernias always emerge lateral to the inferior epigastric vessels which appear as a similar peritoneal plica, the epigastric fold, and with the same direction upwards against the umbilicus. These two folds are visible at herniography and form diagnostic guide-lines (Fig. 5 b). In some anatomic textbooks (HOLLINSHEAD 1971, Gray's anatomy by WARWICK & WILLIAMS 1973) the midline fold containing the urachus is called the median or middle umbilical fold, and the fold containing the remains of the umbilical artery is then called the medial umbilical fold, and the epigastric fold is named, instead, the lateral umbilical fold. The nomenclature now most commonly adopted is that used in Fig. 1 b.

Medial inguinal hernias, also called direct hernias, are always acquired; they protrude through the triangle of Hesselbach (Fig. 1 b). This area of the abdominal wall is also the posterior wall of the inguinal canal through which the spermatic cord passes medially behind the aponeurosis of the external oblique muscle. This triangle marks a particularly weak part of the wall which here in many cases consists of the transversus aponeurosis and fascia only. The internal oblique muscle has its lower border cranially to this area and the external oblique aponeurosis is thin and distensible. The medial inguinal fossa is by the lateral umbilical fold intersected into two parts, of which the more medial one is called the suprapubic fossa (Fig. 1 b). With herniography it is possible to discern two types of direct hernias emerging either lateral to or medial to the lateral umbilical fold. This division was remarked by FALLIS (1938) and KEYNES (1964) on surgical observations. The lateral umbilical ligament and the inferior epigastric vessels are located in the preperitoneal space and connected both to the covering peritoneum and to the transversalis fascia, which is a continuation of the fascia propria surrounding the whole abdominal cavity. Although they are anchored mostly in the transversalis fascia they are often removed with the peritoneum in anatomic

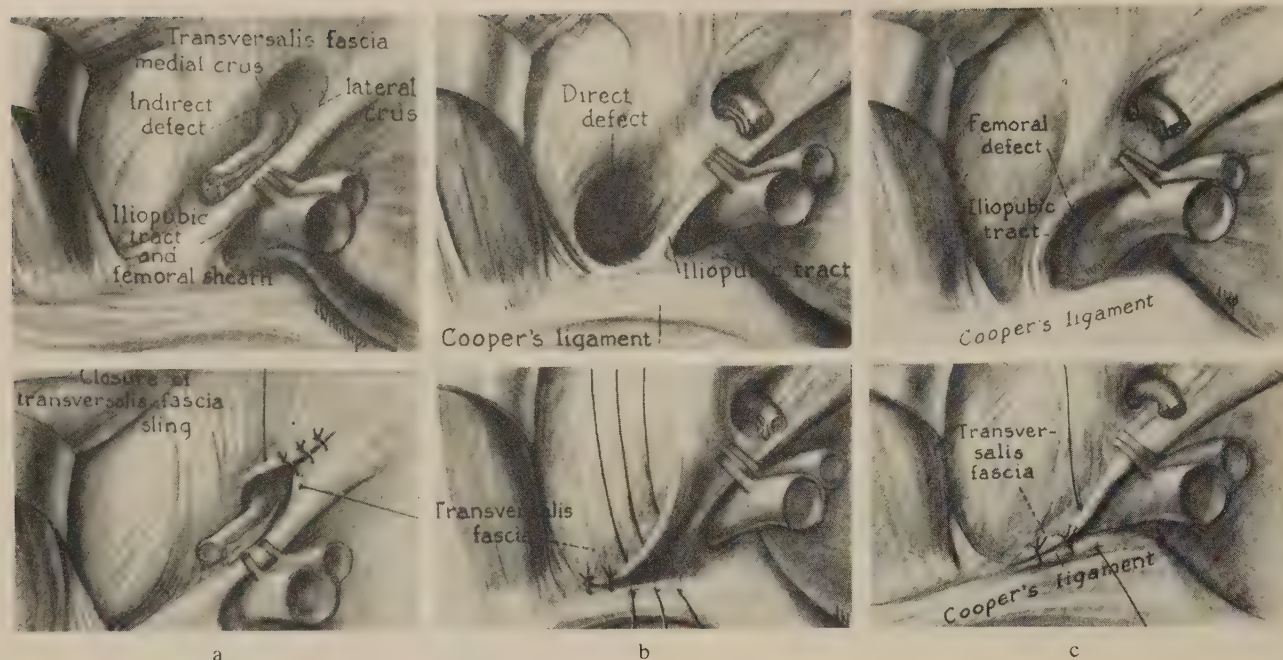


Fig. 3. Defects and repair methods as recommended by NYHUS et coll. (1960) and seen from inner side for 3 most common types of groin hernias. a) Lateral indirect hernia, b) direct inguinal hernia and c) femoral hernia. Cooper's ligament follows close to upper

inner border of pubic crest of pelvic ring. (Figs 2 c and 3 a-c are reproduced by permission from NYHUS et coll.: Clinical experiences with preperitoneal hernial repair for all types of hernia in the groin. *Amer. J. Surg.* 100 (1960), 234.)

illustrations of this fascia (Fig. 3). The corresponding folds were considered by CONDON (1964) to be of no surgical importance either in etiology or repair of groin hernias. More importance was laid by NYHUS et coll. (1960) on fascial condensations in the transversalis fascia (Fig. 3). They were termed transversalis fascia analogues by NYHUS & BOMBECK (1972). One of these is the iliopubic tract which is of special importance, situated as it is behind and parallel to the inguinal ligament. No clear peritoneal fold exists over this transversalis fascia enforcement and it is not seen at herniography apart from its congruence with the inguinal fossae.

Femoral hernias emerge below this iliopubic tract and also inferior to the inguinal ligament (Fig. 3 c). They pass through a potential space medial to the femoral vein, the femoral canal, which has a length of $2\frac{1}{2}$ cm and passes over the pubic crest of the pelvic border. It is the oblique distance between the inner and outer layers of the lowest part of the abdominal wall. Femoral hernias are also caused by a defect in the transversalis layer. An important pressure gradient in the femoral vein occurs at its passage from the leg into the abdominal cavity. The vein is protected by a funnel-shaped fascial construction, the femoral sheath, which also is a derivate and con-

tinuation of the transversalis fascia. When a hernia or lipoma exists in the femoral canal a compression of the femoral vein may occur which can be diagnosed by the phlebographic test (GULLMO 1956, 1957). After correct repair (Fig. 3 c) the compression phenomenon can be alleviated.

The obturator hernia emerges through the obturator canal (Fig. 2 a, b), which is a groove in the lateral upper corner of the obturator foramen. It is a small slit-like opening for the obturator vessels and nerve in the otherwise ligamentous and hard membrane.

The peritoneal outline of the pelvic floor has the same appearance in men and women in its posterior part (Fig. 1 c), which is called the pouch of Douglas. It often has lateral recesses on both sides of the rectum. In supine position the contrast medium collects in these recesses during injection. In women the ovaries, if enlarged, may be observed in these recesses.

In men the anterior part of the pelvic floor forms an even, horizontal plane. In women the uterus causes individual variations in appearance depending on the shape of this organ.

Further anatomic details are given in the sections for the various types of hernia.

3. MATERIAL

Material A. From July 1972 through May 1979 a total of 1 000 herniographies were performed on 914 patients (648 men, 70.9%, and 266 women) of whom 217 had already been operated upon for hernia (23.7%). The age groups by decades are shown in Table 1. In 62 patients a Spigelian hernia was considered to be present in the anterior flank of the abdomen. Bilateral phlebographic test was performed in all patients except 14 in connection with the herniography.

Material B. A series of 500 normal cases was obtained by supplementing hysterosalpingography (HSG) with pelvigraphy using the standard projections for herniography. This series was composed of young women examined for sterility but with passage through the tubes. A similar procedure was recommended by KJELLBERG (1942). Standard radiation protection was observed and lanthanide screens used.

Material C. Anatomic investigations were made on 100 corpses.

Material D. A previous series of 1 010 normal cases which were injected for urography and in which the phlebographic test was performed were considered for correlation.

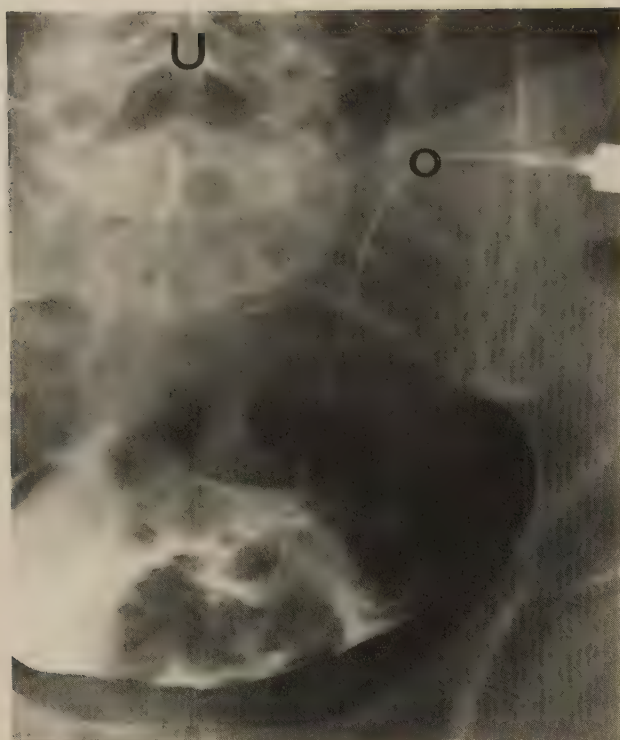
4. TECHNIQUE OF HERNIOGRAPHY

The examination is performed on a fluoroscopy table, preferably a remote-control table which permits fluoroscopy with tilted tube (Fig. 5 a). The best site for puncture was found to be 3 to 4 cm to the left of and 3 cm below the umbilicus. In the midline the tissues may be dense and difficult to penetrate and on the right side the catheter may be trapped in the ileocecal mesentery. On the left side the catheter easily glides down into the pouch of Douglas along the descending colon (Fig. 4 a). The puncture is best made with a mandrine-equipped plastic catheter of the same type as that used for percutaneous cholangiography (Wiechel-Stille). The point of the mandrine or needle must be moderately blunted to avoid perforation of the bowel. A small incision is made in the skin to make the penetration easier. At penetration of the peritoneum the patient experiences some pain of which he should be warned in advance to avoid sudden jerks. Thereafter the mandrine is partly removed as the catheter is conducted downwards with repeated smooth movements. Free positioning

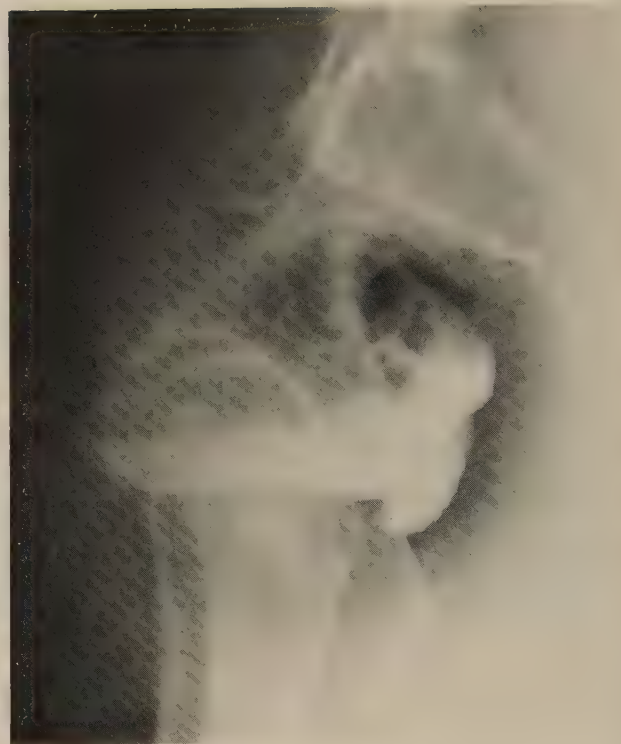
of the catheter is controlled with an injection of saline or 3 to 5 ml of lidocain, one per cent. The beginning of the injection of contrast medium is controlled by fluoroscopy. With free positioning of the catheter the medium flows out around the bowel loops (Fig. 4 a) and collects in the bottom of the pouch of Douglas.

For optimum examination of the groins, 50 to 60 ml of contrast medium is adequate. It can be diluted by flushing with 20 to 30 ml of saline during the extraction of the catheter. Contrast medium of the meglumine metrizoate type (iothalamate meglumine) was used in most cases (Isopaque Amin, Nyegaard, 200 mg I/ml, or Conray Meglumin, Astra-Meditec, 282 mg I/ml). In 30 cases metrizamide (Amipaque, Nyegaard, 6.75 g I/20 ml $\times$ 2) was used with adequate results.

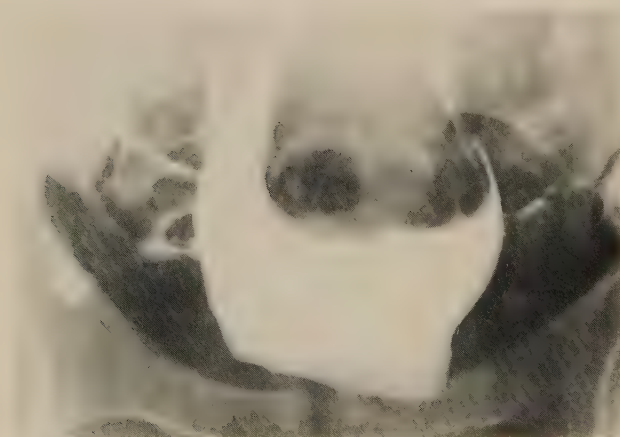
The table should preferably be tilted 25 degrees foot down during injection. However, the contrast medium will usually accumulate in the pouch of Douglas even in the horizontal position (JORULF 1975). In a few cases with a low positioned transverse colon the catheter bent upwards whereby the contrast medium spread upwards around the liver and collected in the supramesocolic space only. After standing for a while filling of the pouch of Douglas was achieved. The pouch is first examined in the supine position for inner pelvic hernias. The patient is then turned to the prone position (Fig. 5 a). Repeated straining manoeuvres are performed in alternate, slightly oblique positions, for better filling of the inguinal fossae. Exposures are made in 4 standard positions (Fig. 5 c-f). The first (No. I) is the principal view which should be made in exact p.a. position with the beam directed 25 to 30 degrees cranially. By fluoroscopy the streak of the crena ani is placed through the symphysis for symmetric position (Fig. 5 b). The patient is then turned about 20 degree for an oblique projection with the tube in the same direction, with the right side down (projection No. II) and then with the left down (projection No. III). Finally a No. IV projection is used with the beam direction straight right-angle to the table. These projections are directive, and supplementary exposures should be made in positions where a hernia is best observed at fluoroscopy. Most hernias are best filled during straining. If the sac contains bowel or omentum it can be better filled after reducing the sac and by having the examined side turned downwards on repeat straining. In fact most small hernias are best palpated in this position. If desired, stereo-



a



b



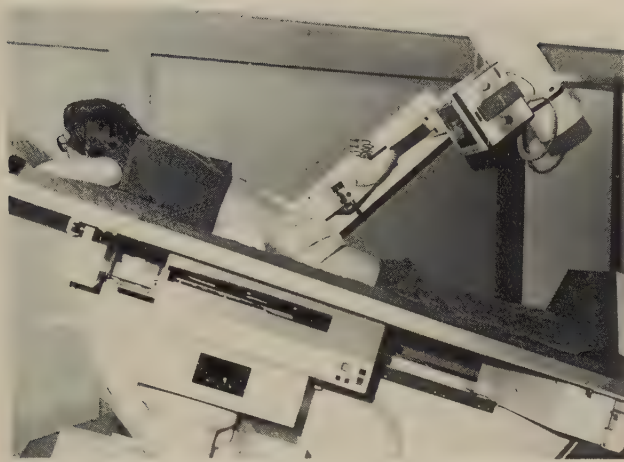
c

Fig. 4. Injection procedure. a, b) Man 57 years. Puncture site at O to left of umbilicus (U). Catheter passed down to bottom of pouch of Douglas. Exposure made after injection of 20 ml contrast medium. b) At end of examination. Patient standing, lateral projection. Normal male pelvic floor with pouch of Douglas behind. c) Man 56 years. Usual appearance of pouch of Douglas after filling with 40 ml in supine position. Rectum in this case moderately distended with contents and makes rounded defect posteriorly. Some contrast medium has filled lateral fossa in right groin.

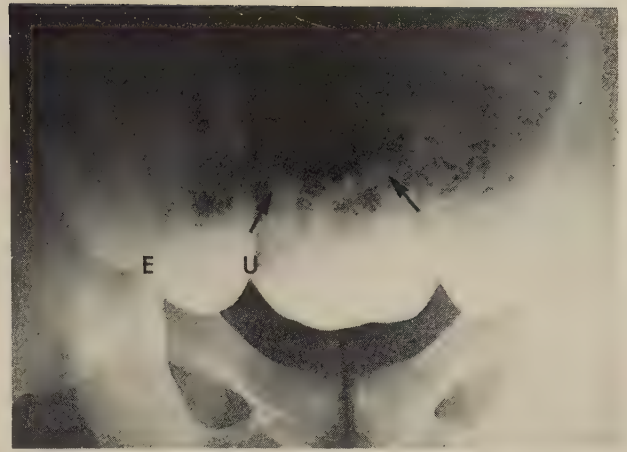
Table 1

Number of patients in different age groups examined with herniography

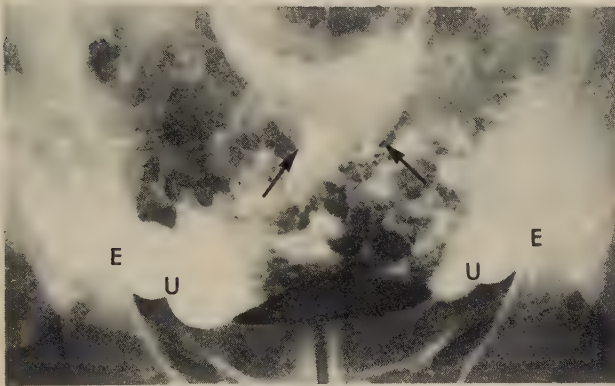
	Age groups (years)								Total
	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-	
Males	23	92	139	107	134	104	41	8	648
Females	10	31	52	56	56	45	14	2	266
Total	33	123	191	163	190	149	55	10	914



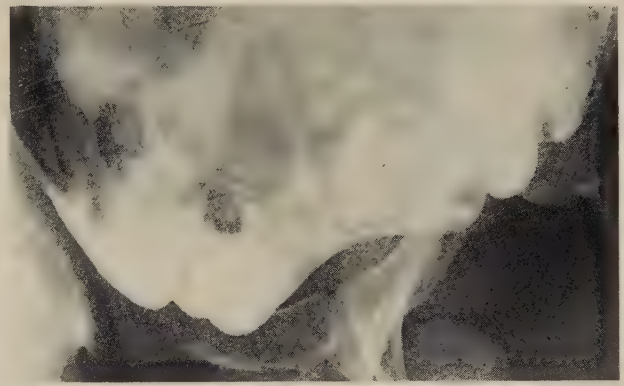
a



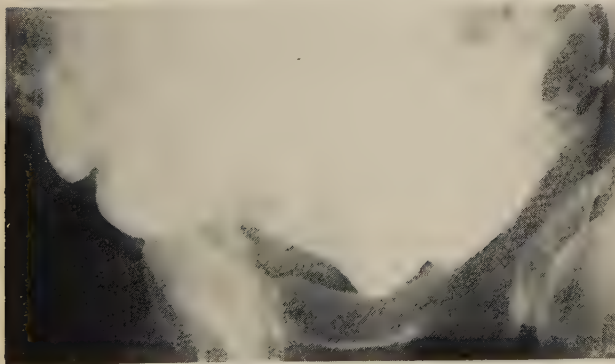
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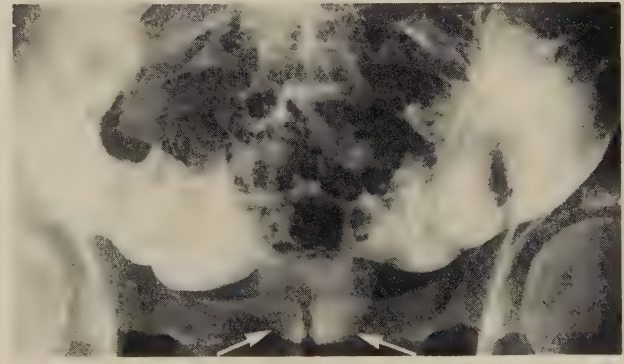
c



d



e



f

Fig. 5. Standard projections for herniography a) Projection I. Round hard pillow placed under midabdomen. Remote-controlled table preferable. b) Man 16 years. Normal inguinal fossae in projection I. Umbilical fold in this case rather prominent (U). Epigastric fold makes only low impression (E). Pouch of Douglas in this position only slightly filled (→). Projection of the crena ani

through symphysis for true p.a. adjustment. c-f) Projections I, II, III and IV, respectively. Man 20 years. Normal fossae with less prominent umbilical folds (U). Projection IV, beam at straight right angle to the table, bottom of pouch overlapping inguinal contour (f). In cases with a broad pouch this can be disturbing; it is prohibited in projection I.

scopic films are obtained by shifting the table 3 cm to each side of the midline.

The filling of the groin regions can be enhanced in prone position by placing a hard rolled pillow across

the middle part of the abdomen (Fig. 5 a). This may prevent the pubic regions from being pressed too hard against the table, with consequent non-filling of a sac, which occurred in some females.



Fig. 6. a-c) Phlebographic test, normal cases. a) Girl 12 years, narrow field can be centered along vein with needle as aiming point. b) Woman 19 years, c) woman 22 years. In these 3 normal cases the femoral vein has straight medial contour in spite of

heavy straining during exposure. d) Typical compression phenomenon. Man 57 years, symptoms of pain in the right groin. At operation, large hernial lipoma found in femoral canal.

After examination of the hernia regions a lateral view of the pouch of Douglas and the pelvic floor (Fig. 4b) is exposed on the standing patient. The exposures should be made within 20 min after injection, after which resorption begins and the peritoneal outline may be blurred. After half an hour the bladder begins to fill. No preparation of the patient is needed for herniography except the bladder must be emptied immediately before the examination. A filled rectum can be of advantage in pushing the contrast medium forward to the inguinal regions. The appearance of the pouch of Douglas depends on the contents of the rectum (Figs. 4c, 60).

5. TECHNIQUE OF THE PHLEBOGRAPHIC TEST

This is a further test of the stability of the tissues in the groins. It can be of great help in evaluation of the herniographic films and is made preferably in immediate connection with the herniography. The phlebographic test was standardized to be carried out with the patient in the supine position. A femoral

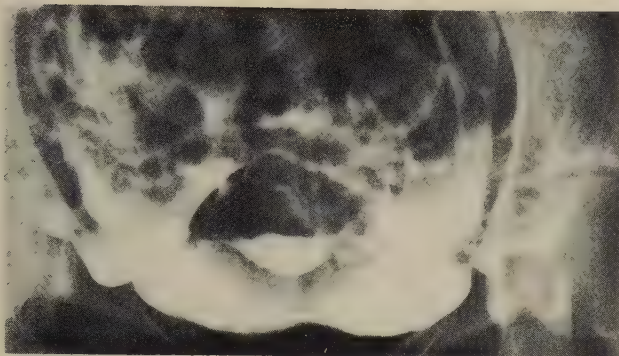
hernia will often remain filled also in this position because it is the most posteriorly located hernia in the groin. Its true nature will thereby be proved by its close relation to the femoral vein.

The patient is first trained to strain long and effectively. The tension of the abdominal muscles is palpated and may be improved by the patient lifting his head. The puncture of the vein is made in the inguinal fold on the medial side of a palpating finger on the femoral artery. The needle is advanced in proximal direction well into the lumen.

Twenty ml of a 45 per cent contrast medium is used. The injection is made rather rapidly and the straining is timed to begin when about half of the contrast medium is injected. The exposure is made just before the end of injection. A narrow field is centered along the vein to reduce the radiation dose (Fig. 6). The site of the needle is the aiming point.

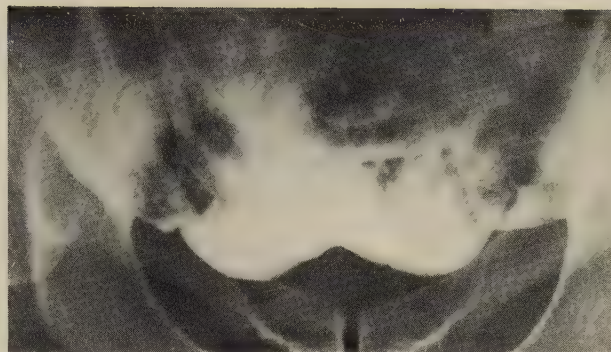
6. NORMAL HERNIOGRAPHY

With the patient in the herniographic position the contrast medium is by gravity pooled into the 3



a

Fig. 7. Normal inguinal fossae. a) Woman 27 years. Normal herniography (pelviography) following hysterosalpingography. Ovarian fossae lateral to uterine corners. Normal ovaries may be covered by contrast medium in these fossae. b) Man 36 years. No



b

evident epigastric folds, thus lateral and medial inguinal fossae are combined in one broad fossa. Supravesical fossae of normal appearance.

inguinal fossae, which are separated by the two main folds on each side. Of these the lateral umbilical fold (U in Fig. 5b) is most prominent and is almost always discernible. It proceeds from the internal iliac artery on the lateral wall of the small pelvis. It has no connection with the femoral artery in the groin and may therefore have a somewhat varying position in turning upwards towards the umbilicus. In young, normal cases this fold separates the medial inguinal fossa from the supravesical, which is a slight bulging on either side of the midline. A medially situated umbilical fold containing the rest of the urachus is seldom discernible; thus, the supravesical fossae are often confluent (Fig. 5b). In elderly patients and in many cases with hernia, the lateral umbilical fold is often displaced medially. It may even be so marked that it can be of pathologic significance (discussed in detail in chapter 13).

The epigastric fold (E in Fig. 5b) is the medial boundary for the lateral inguinal fossa. It contains the inferior epigastric vessels coming from the femoral vessels in the groin and has a fixed position. It is not always discernible. The 3 fossae on each side normally bulge moderately forward over the inguinal ligament (Fig. 7) but individual variations occur and often also asymmetry. In obese patients the umbilical fold is often broad and protruding (cf. Fig. 45b).

The deep inguinal ring in the lateral half of the lateral fossa is the emerging place for the spermatic cord in men and for the round ligament in women. This site appears as a small funnel-shaped, pointed pouch with medial direction and continuing directly from the lateral contour of the abdominal wall (Fig.

8a, to the left, Fig. 24c). An open processus vaginalis, as in communicating hydrocele, is located within the spermatic cord. If not much dilated, such an open processus should not be considered pathologic. On question, the patient in Fig. 8b reported some pain in the left groin. The processus is in this case obviously dilated as in an incipient lateral hernia but is still located within the inguinal canal.

The medial inguinal fossa and the supravesical fossa are the outlets for the two types of direct hernia. At fluoroscopy it is possible on straining to differentiate a pathologic hernial bulging of a fossa by comparison with the other side. The distinction applies only to the direct medial hernias which in most cases represent a bulging of the whole fossa. In surgical texts (HOLLINSHEAD 1971) a fourth fossa is also described, a small dimple-shaped femoral fossa, below the inguinal ligament and the iliopubic tract on the inner side and medially to the femoral vein. In Fig. 1b it is seen below the lateral edge of Hesselbach's triangle. It points to the femoral ring, which is the emerging place for femoral hernias (Fig. 3c). In normal cases, no fossa is discernible here at herniography. If so, possibly an incipient femoral hernia is present.

7. INDIRECT (LATERAL) INGUINAL HERNIA

By definition this type of hernia emerges from the lateral inguinal fossa through the deep inguinal ring and always protrudes lateral to the inferior epigastric vessels (Fig. 1b). This type is the common hernia of children and young males, and is generally considered to be of congenital origin (ZIMMERMANN 1964, WHITE & HALLER 1978). The prerequisite for

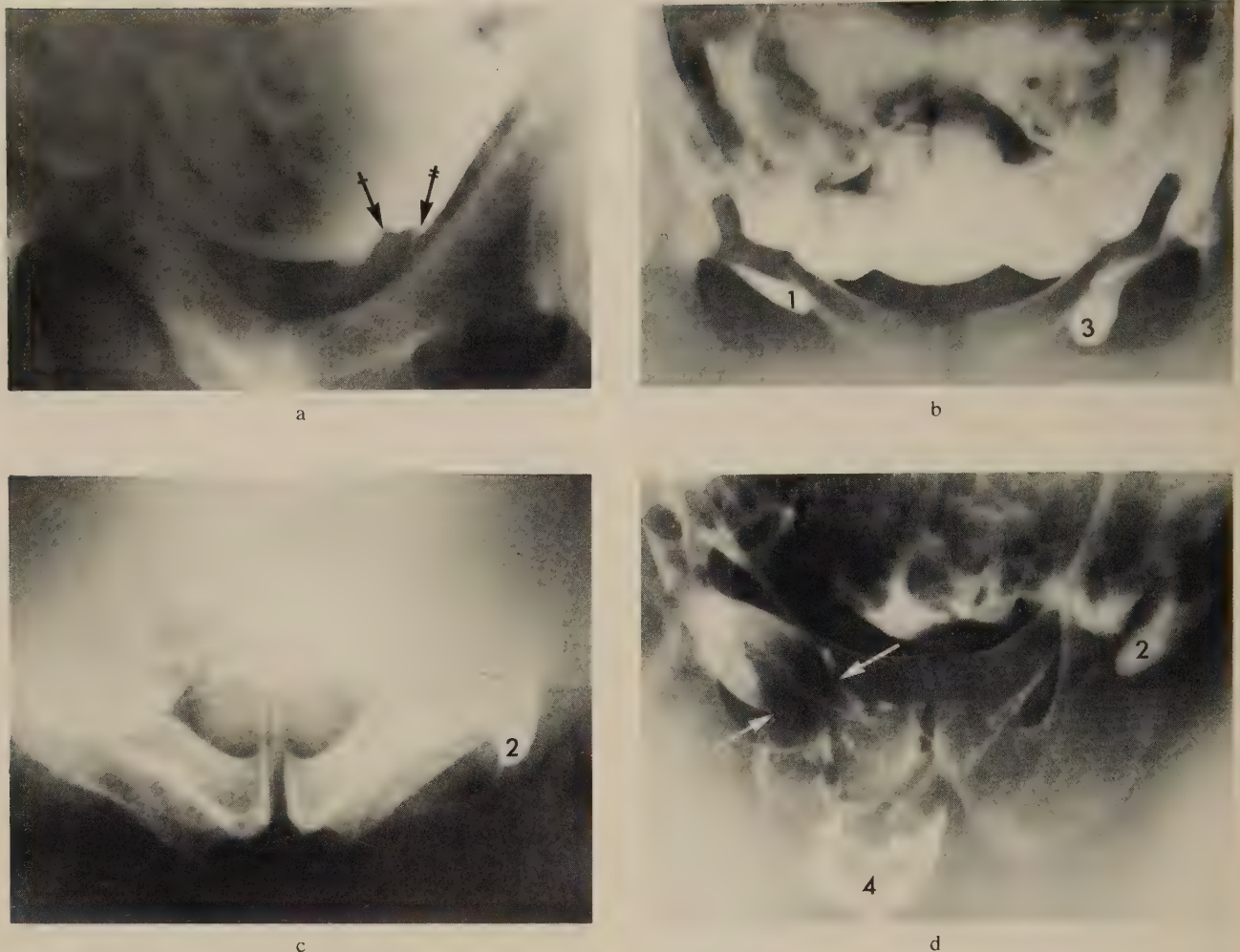


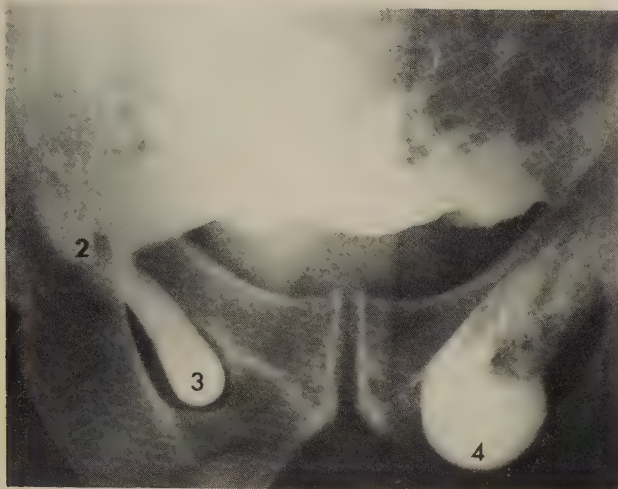
Fig. 8. Different stages of indirect hernias. a) Man 45 years. Small thorn-shaped funnel in emerging spermatic cord ($\leftrightarrow$), on posterior lateral border of lateral fossa, therefore best seen on oblique film (projection III). Normal finding, therefore labelled stage 0 of open processus vaginalis. Indentation caused by inferior epigastric artery ($\leftrightarrow$). b) Woman 18 years. So-called diverticulum of Nuck bilaterally. Pain in left groin. Cases with the appearance on right side labeled stage 1, as a rule without symptoms. On left dilated

diverticulum but still within inguinal canal (stage 3). c) Man 33 years. Pain in left groin and testis. A lateral hernia stage 2 emerging through broadened deep abdominal ring and pointed continuation of sac into spermatic cord. d) Man 56 years. Large scrotal hernia on right side (stage 4). Pain in left groin. On this side lateral hernia stage 2 into spermatic cord. Large sac on right side, narrowed both in deep abdominal and in superficial ring ($\rightarrow$).

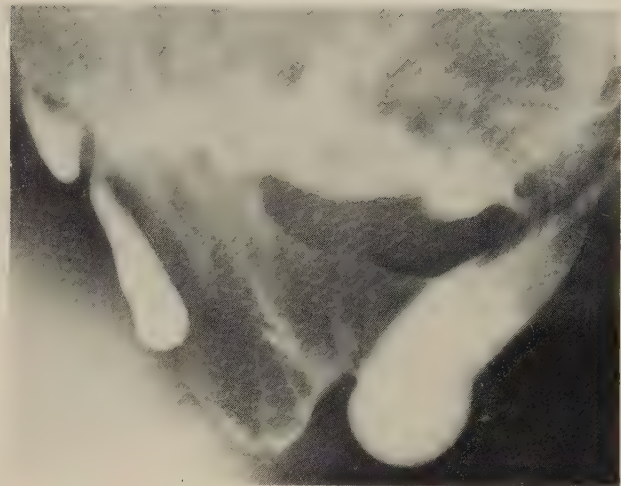
its development is a patency of the embryonic processus vaginalis. The testis proceeds through the inguinal canal in the 7th fetal month (Fig. 1 a). This peritoneal process obliterates shortly after birth. However, at autopsy ROWE et coll. (1969, 1971) found a patent process in 20 per cent of asymptomatic adult males. A congenital lateral hernia in males is always located within the spermatic cord in close connection to the vas deferens. At operation such a hernia is found, on straining, to distend the funiculus with its surrounding cremaster muscle and fascia. A very large hernia of this type may have overdistended the widened cord and the fundus of the sac is then located in the surrounding fat

(BROOMÉ 1979). In the female fetus also an open embryonic processus vaginalis exists along the round ligament. An acquired type of lateral hernia was described by HAFFERL (1953), ANSON & MCVAY (1971) and BECKER et coll. (1971). The hernia may protrude through the deep inguinal ring reopening a closed processus vaginalis or advance along the outer side of the cord. Recurrent lateral hernial sacs are always of acquired type (GRIFFITH 1978).

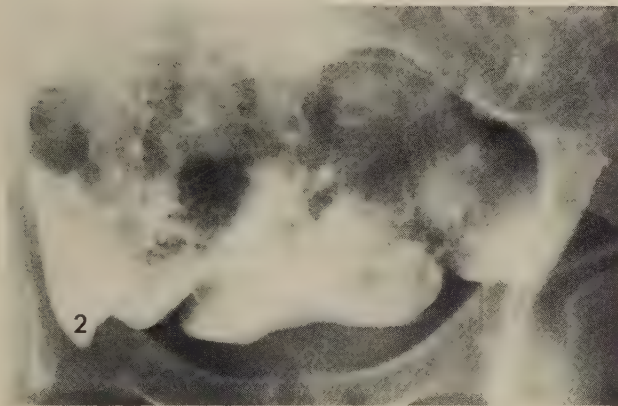
Old clinical observations suggest that lateral hernias are more frequent on the right side than on the left (HUNTER 1786, quoted by STEVENSON & JOHNSON 1964, CONDON 1964, 1978). The reason could be a later descent of the right testis, with



a



b



c

Fig. 9 a, b) Man 53 years. Pain and some swelling in left groin. No hernia palpable. No symptoms on right side. Omentum-filled large lateral sac on left side protruding through superficial ring (stage 4). Lateral hernia stage 3 within spermatic cord on right side, also additional lateral hernia stage 2 presumably of acquired type. c) Man 56 years. At 6 years of age bulging hernia in right groin, which regressed spontaneously. At age 48 operated upon for medial hernia on left side. At present symptoms of pain in right groin. The lateral hernia stage 2 on right side presumably of acquired type. Left groin somewhat lifted postoperatively.

failure of obliteration of the vaginal process on the right side.

Present series. With herniography 4 stages in the development of an indirect hernia could be distinguished (Table 2). In normal cases a quite small pointed beak may be present at the outlet of the ductus deferens through the deep ring (Figs 8a, 24c) which is considered normal. The first stage of a hernia consists of a narrow persistent processus vaginalis. In women such incipient hernias are called diverticula of Nuck (Fig. 8b). They are most often found obliterated, half way down in the inguinal canal. In males similar narrow canals are also found in cases with communicating hydrocele (Fig. 11). In some cases irregularities indicating scarring may represent failure of obliteration (Fig. 10a). If not dilated, hernias stage 1 cause no symptoms. If dilated they are classified as stage 2 or 3, depending on the length of the sac.

Stage 2 consists of a marked deep and wide pouch-

ing through the deep inguinal ring (Figs 8c, d, 9). Some may continue as a narrow canal, an open processus vaginalis (Fig. 8c). This type of hernia was often confirmed at operation. As a rule, it causes pain in the groin or testis.

Stage 3 consists of a rather large sac, still within the inguinal canal and not protruding out of the superficial inguinal ring (Fig. 9a, b, right side). This type of hernia is most common in young males with obscure symptoms in the groin and no palpable sac. The symptoms often simulate prostatitis. A hernia of this incomplete type is often found on the contralateral side to a large indirect hernia, stage 4 (Table 3). Such a case is illustrated in Fig. 9a and b in which an additional lateral hernia, stage 2, is found on the same side. This most lateral sac is of acquired type.

Stage 4 consists of a complete lateral hernia protruding through the superficial inguinal ring and descending more or less into the scrotum (Fig. 8d) or into the labium majus (Fig. 10b). Surprisingly, many



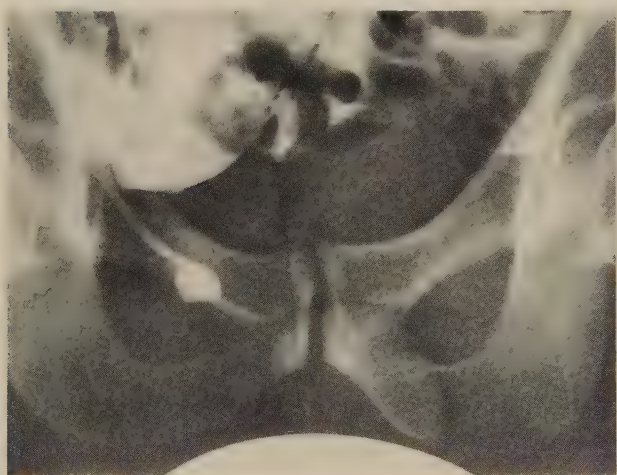
a

Fig 10. Indirect hernias in females. a) Woman 57 years. Pain in left groin. Lateral hernia stage 3, indication of scarring (confirmed at operation). Missed obliteration? On right side, incipient in-



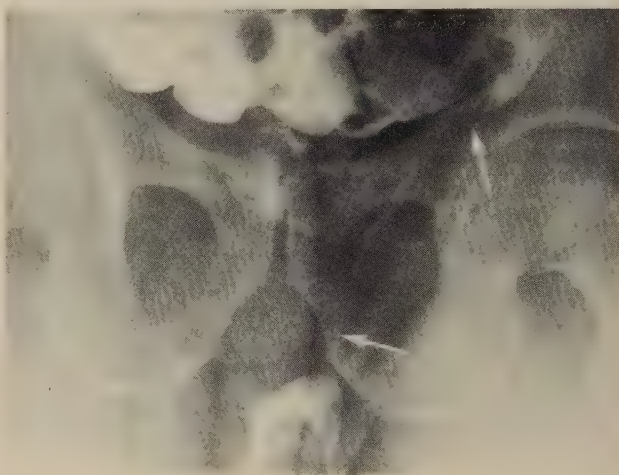
b

guino-femoral hernia. b) Woman 58 years. Symptoms of swelling of right labium majus on standing. Hernia not palpable. Bilateral, lobulated indirect sacs, stage 4, confirmed at operation.



a

Fig. 11. Open processus vaginalis in males. a) Man 35 years. Pain and sense of heaviness in right groin. Open processus vaginalis stage 1, small dilatation within spermatic cord. Probably beginning hydrocele. Also broad fossa which may be the cause of



b

symptoms. b) Man 45 years. Had observed swelling of left testis. Communicating hydrocele with very narrow processus vaginalis (→), may be classified as stage 1. Some dilatation at emergence site in deep abdominal ring. Confirmed at operation.

Table 2

Frequency of different stages of indirect hernias. Percentage (in parentheses) correlated to total number of males and females

Stage	Right groin		Left groin	
	Males	Females	Males	Females
1	21 (3.2)	2 (0.8)	17 (2.6)	4 (1.5)
2	87 (13.4)	13 (4.9)	90 (13.9)	10 (3.8)
3	40 (6.2)	13 (4.9)	42 (6.5)	15 (5.6)
4	62 (9.6)	8 (3.0)	60 (9.3)	6 (2.3)
Total	210 (32.4)	36 (13.5)	209 (32.3)	35 (13.2)

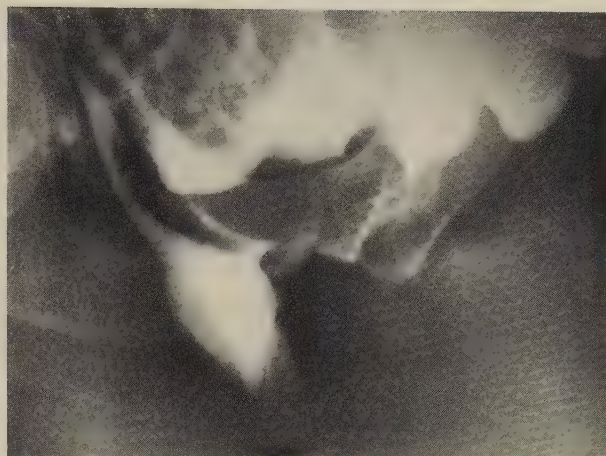
Table 3

Occurrence of contralateral indirect hernia sacs in cases with indirect hernias in stages 3 and 4. Males and females counted together

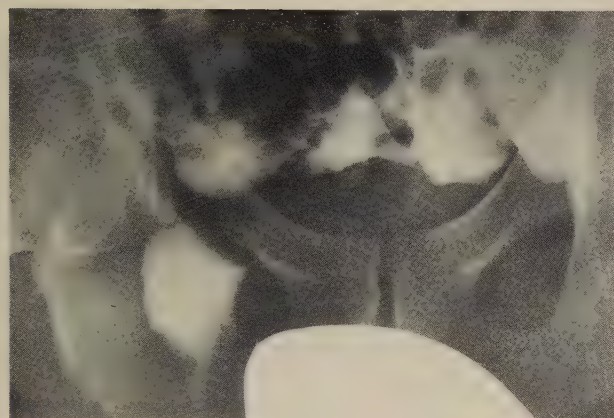
Hernia	Total	Contralateral sacs in stage				
		1	2	3	4	Total
Right groin						
Stage 3	53	3	10	10	7	30
Stage 4	70	0	11	7	3	21
Total	123	3	21	17	10	51
Left groin						
Stage 3	57	1	6	10	7	22
Stage 4	66	4	13	7	3	27
Total	123	5	19	17	10	49



a



b



c

Fig. 12. Man 51 years. Sense of discomfort in right groin. a) After many repeated straining manoeuvres, filling of open processus vaginalis. b) Structures within spermatic cord, possibly vas deferens. c) At end of examination dilatation of sac in scrotum. Considered as indirect hernia stage 4 with very narrow neck of sac. Could also be classified as communicating hydrocele but the sac was empty at beginning of examination.

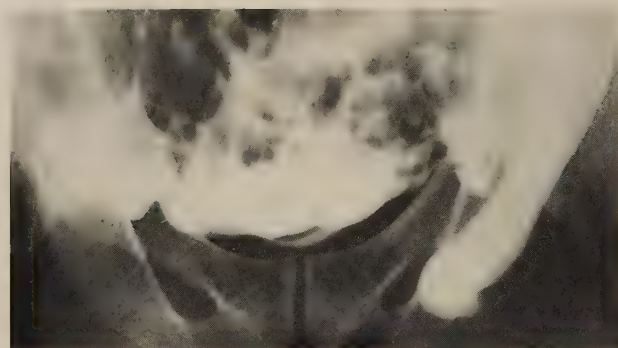
of these large hernias could not be palpated at clinical examination. The neck of the sac was often narrow in the deep ring, which could be the reason for a missing impulse on the palpating finger on coughing. Of the 136 large lateral hernias 87 (64.0%) were of the narrow-neck type. Moreover the visceral content of the sac, if any, is soft and escapes on palpation of the scrotum. In a sac with wide neck, it may be questioned if the sac represents a laterally situated direct medial hernia. A reliable criterion for indirect hernia is an unbroken lateral contour from the flank downwards in oblique medial direction into the sac (Fig. 13). In direct hernias of laterally emerging type, a shelf-like indentation of the inferior epigastric vessels is discernible. By definition these vessels turn laterally around direct hernias.

In cases with a very large lateral hernia the sac may take up most of the contrast medium. In order to examine the other side also, the patient can be asked to retain the large hernia with his hand. On

this manoeuvre also the medial fossae on the same side are better filled; otherwise a dragging effect of the large hernias occurs with obliteration of the inguinal contours (Fig. 14a).

The old observations that lateral hernias are most common on the right side is not documented in the present series (Table 2). The frequency is approximately the same on both sides, in males as well as in females. One explanation could be that large hernias were not routinely referred for herniography, which was reserved for questionable cases. Against this explanation speaks the fact that 122 cases with large lateral hernias were found in men (18.9%), many being referred with the question as to type of hernia and size of the neck of the sac, for better planning of operation.

The frequency of contralateral occurrence of the same indirect type of hernia appears in Table 3. The congenital nature of these hernias is certainly the reason for the frequent bilaterality. Of the 123 cases



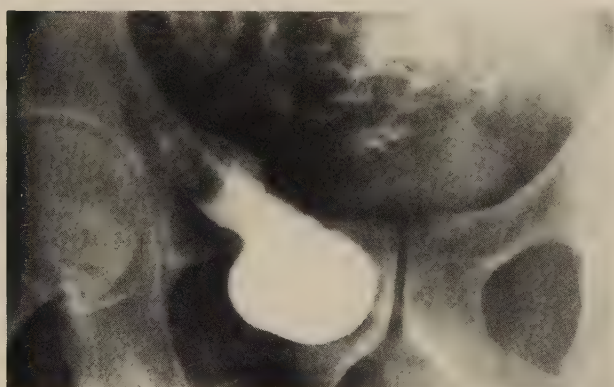
a

Fig. 13. Man 33 years. Pain in left groin, sometimes also in right. No hernia palpable. Suggestion of prostatitis. a) On hard straining indirect sac could be pressed down into superficial ring. On quiet respiration, regressed almost completely. Also additional small



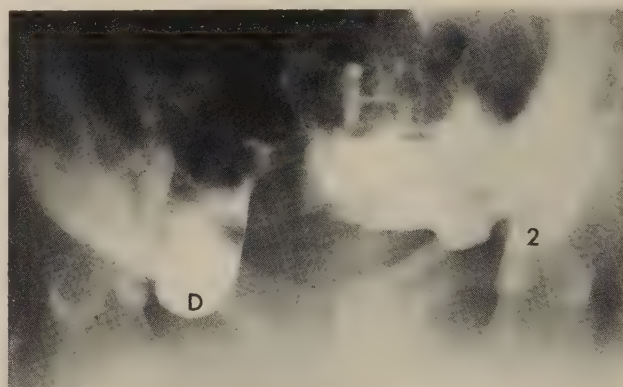
b

direct sac. b) Oblique film (projection III). Straight lateral contour of this indirect hernia, stage 3 (almost 4). A lateral hernia stage 2 on the right, most evident in this projection.



a

Fig. 14. a) Man 73 years. Obese patient. Pain in right groin. Hernia not diagnosed clinically. No impulse felt on coughing. Bowel loop protruding into narrow neck of indirect sac may act as valve against pressure variations. b) Man 40 years. Previously



b

operated upon for lateral hernia on left side. Now pain in the right groin. On left side recurrent sac of lateral hernia stage 2. On right side direct medial hernia (D). Impulse felt in superficial ring on coughing.

with right-sided indirect hernias (stages 3 and 4) 51 had indirect hernial sacs (stages 1–4) on the left side (41.5%), of the 123 left-sided 49 had also a right-sided sac (39.8%). In Table 3 stages 3 and 4 were separately considered because these were cases in-

Table 4

Number of additional hernial sacs (same side and contralateral) in 123 cases with indirect hernias (stages 3 and 4) on the right side. Total number of additional sacs: 133 (in 123 patients)

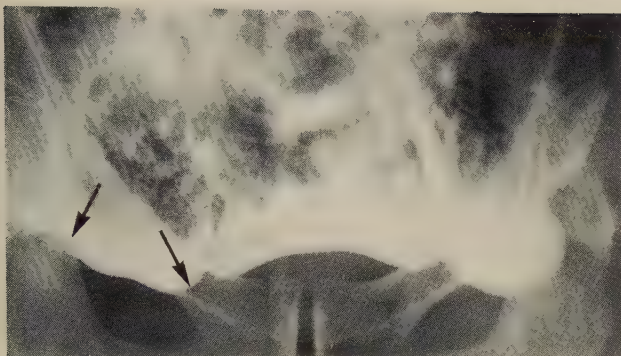
Hernial sacs same side (right)		Contralateral side (left)
Indirect hernia (stages 3 and 4) 123	—	27
Direct hernial sacs	29	33
Incipient femoral hernia	20	16
Complete femoral hernia	4	4
Total number of additional hernia	53	80

dicating operation. In cases with stage 2 operation was occasionally advised depending on the symptoms.

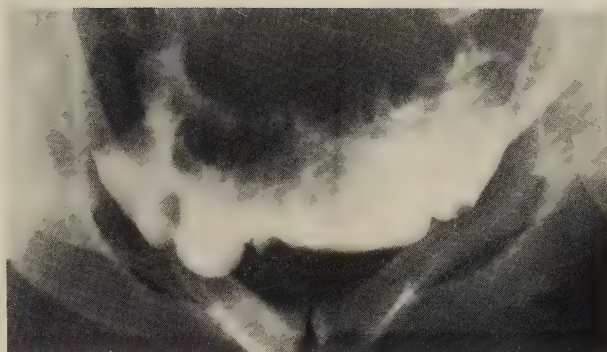
Table 4 gives the number of additional hernias of surgical interest in the most common type of hernia, the indirect (stages 3, 4) on the right side. It is evident that attention should also be paid to the medial compartment (including the femoral fossa). Thus, in 53 cases hernias were found (43.1%). On the contralateral side operation could be indicated in at least the indirect hernias (27) and the complete femoral (4); in total 31 cases (25.2%).

8. DIRECT (MEDIAL) INGUINAL HERNIA

These hernias protrude above the inguinal ligament and medially to the inferior epigastric vessels.



a



b

Fig. 15. Direct inguinal hernias. a) Man 50 years. Pain and hernial bulging lateral in left groin. Left-sided broad direct hernia of lateral type descending on straining. Lateral indentation of inferior epigastric fold. On right side, marked weakness in posterior wall of inguinal canal (between →). Supravesical fossae normal

on both sides. b) Woman 31 years. Severe pain in right groin more than one year. Sportswoman (riding). Normal fossae on left side. On right side, direct hernia of lateral type. At fluoroscopy bulging down distinctly on straining. Also incipient indirect hernia of broad acquired type.

The site of emergence has been defined as the triangle of Hesselbach (Fig. 1 b) which corresponds to the posterior wall of the inguinal canal. This region can be clearly delineated in the internal aspect only by the structures of the transversalis fascia. The base of this triangle is the iliopubic tract in this fascia (Fig. 3 b) which runs parallel to the inguinal ligament. The lateral umbilical fold divides this region into two medial fossae: the supravesical most medially and the medial inguinal fossa proper. From both these fossae a hernia can protrude directly through the superficial inguinal ring.

Direct hernias can therefore be lateral or medial, or even double-saccular (BURTON 1950, HARKINS 1964, CHANDLER 1946, KEYNES 1964, HOLLINSHEAD 1971). They are most often broadbased and dome-like and very seldom cause strangulation (ANDREWS & BISSELL 1934). In some cases, however, the medial type was found to be narrow and funicular in shape (GINZBURG et coll. 1954, MCVAY 1978). BURTON & BLOTNER (1941) found such diver-

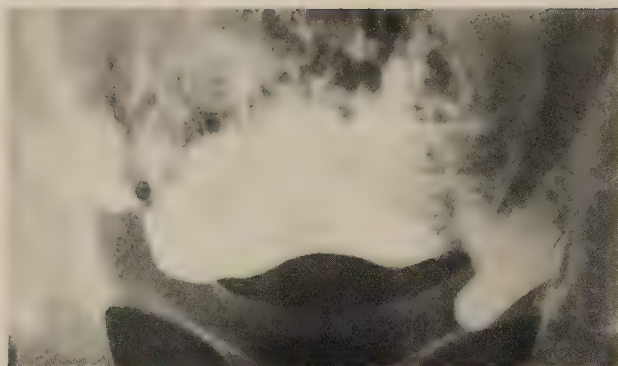
ticular direct hernias in 2.6 per cent of primary hernias. In recurrent hernias their frequency increased to 13.8 per cent. Direct hernias are acquired and are said to be very rare in women (HARKINS 1964). They are observed in adult life only, when heavy straining is imposed upon the abdominal wall. In the elderly a decrease of muscle tone and fascial strength may occur. In old men impaired micturition is often the cause of this type of hernia. They often contain bladder and such patients may have to urinate twice on rising in the morning. Otherwise these hernias are symptom-free; such hernias in elderly men should not be operated upon (ROMANUS 1978). The most medial type of direct hernia is called by some authors external supravesical hernia (CHANDLER 1946, KEYNES 1964). From the same fossa an internal supravesical hernia may rarely descend behind the symphysis. Such hernias should be better called anterior perineal hernia or interior prevesical hernia.

In the present series direct hernias were subdivided into three groups (Table 5). In a few cases it

Table 5

Frequency of the 3 types of direct hernias in 648 males and 266 females. Percentage in parentheses

Direct hernias	Right groin		Left groin	
	Males	Females	Males	Females
Lateral type	131 (20.2)	8 (3.0)	120 (18.5)	8 (3.0)
Medial type	103 (15.9)	7 (2.6)	69 (10.6)	4 (1.5)
Combined broad type	28 (4.3)	6 (2.3)	13 (2.0)	—
Total	252 (38.9)	21 (7.9)	192 (29.6)	12 (4.5)



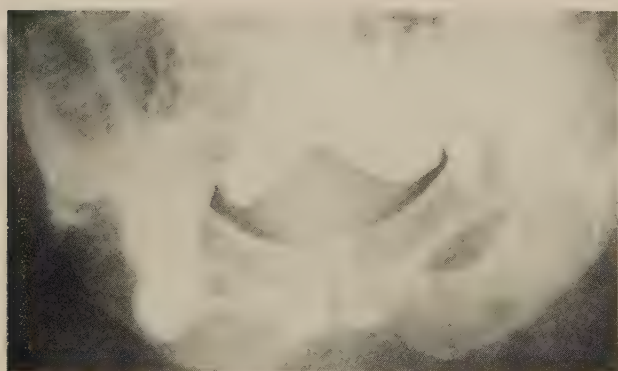
a

Fig. 16. Man 48 years. Pain in both groins. No hernia palpable but impulse on finger bilaterally on coughing. On left side direct hernia of lateral type and partly diverticular within inguinal canal.



b

On right side, broad medial hernia emerging from supravascular fossa and most evident on oblique view (b). Left side confirmed at operation.



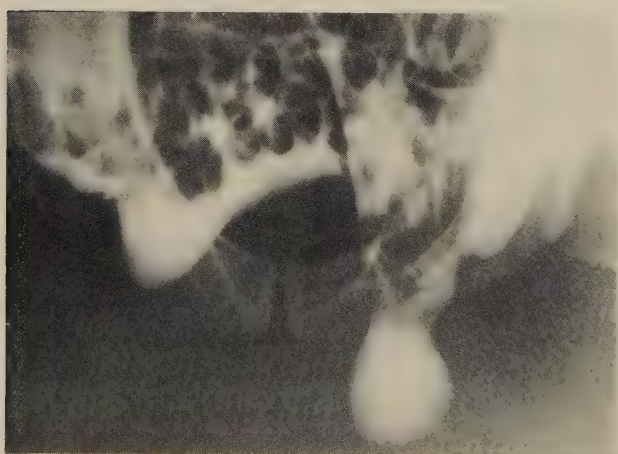
a

Fig. 17. Man 57 years. Palpable hernia in right groin since heavy painful straining manoeuvre one year previously. Large direct hernia of lateral type. Indentation on lateral contour marks in-



b

ferior epigastric vessels. On left side, incipient small indirect and also lateral direct hernia. Right side confirmed at operation.



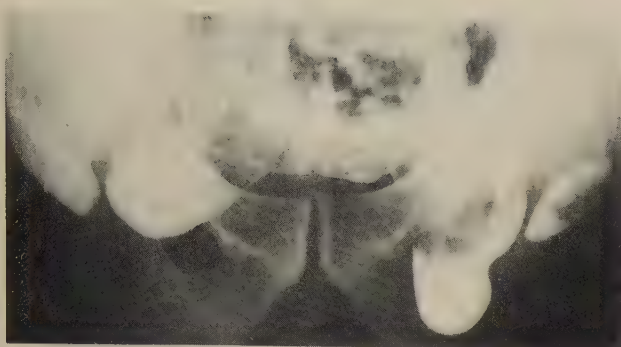
a

Fig. 18. Direct hernia. a) Man 68 years. Many years, hernia in left groin. Some pain on right side. Large direct hernia of lateral type in left groin. At operation most of posterior wall absent. On right side, broad incipient hernia from medial supravascular fossa. b) Man 41 years. Reducible hernia medial in left groin and impulse



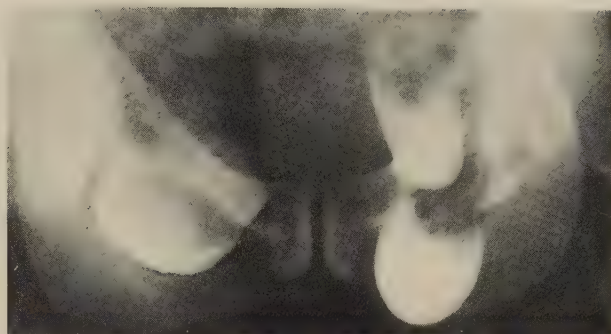
b

felt in right superficial ring. Emerging sites different. On left side, direct hernia of medial type from supravascular fossa. Small persistent medial inguinal fossa lateral to umbilical fold. On right side, incipient direct hernia lateral to this fold. Inferior epigastric folds discernible on both sides). Confirmed at operation on left side.



a

Fig. 19. Multiple hernias. a) Man 46 years. Reducible hernia in left groin. On right side impulse only. Left hernia of direct type confirmed at operation, posterior wall absent. Umbilical fold possibly displaced medially. Incipient indirect hernias bilaterally. b) Man 43 years. Same clinical findings. On left side one large in-



b

direct and one direct hernia, higher up, rather narrow, of lateral type. The latter of acquired type (also confirmed at operation). Both cases: broad-based combined direct hernia (group 3) on right side.

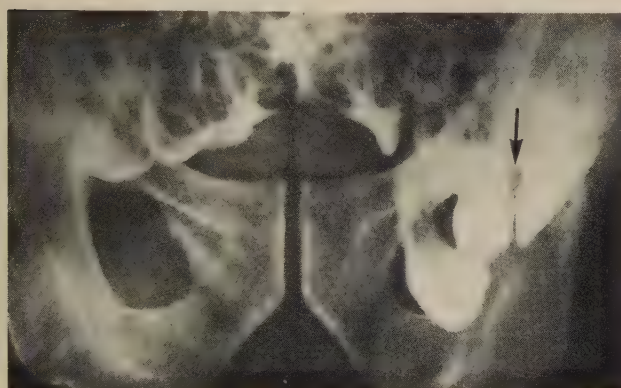


Fig. 20. Man 61 years. Small hernia and impulse felt in left groin. Double direct hernia. Lateral to inferior epigastric fold (→), incipient indirect hernia, acquired type. Phlebographic test normal, indicating all sacs of inguinal type emerging above inguinal ligament.

may be difficult to distinguish between a normal deep inguinal fossa and a manifest direct hernia. However, on fluoroscopy, a direct hernia is clearly observed to bulge more on straining than does a normal fossa; diagnostic difficulties were therefore seldom met with in the present cases. Many patients with this type had multiple and often bilateral hernias. The great number of hernias in Table 5 therefore represents the relative frequency of the various types of direct hernial sacs. The number of patients is somewhat lower than the total number of hernias. Most common are lateral, direct hernias on the right side in males (Figs 14b, 15, 16, 17).

Less frequent is the medial type emerging from the supravesical fossa (Figs 16, right side, 18). Cases with very broad bulging in which the umbilical fold was not clearly discernible belong to the third group (Fig. 19). Admittedly these can be difficult to

distinguish from cases with a broad fossa (cf. chapter 13), which, however, also includes the lateral fossa, the umbilical fold being displaced medially. The common opinion that women do not have direct hernias is disproved in the present series; 21 direct hernias were found on the right side and 12 on the left in a total of 266 females (Fig. 15b). These women acquired symptoms after hard physical work or sport. Direct hernias are often multiple on the same side (Figs 20, 25). In Table 6 occurrence of additional hernias is presented in correlation to the two types of direct hernias which are most common in the right groin. In bilateral cases the same type of hernia also often occurs on the contralateral side. Of the bilateral cases 51 (36.7%) were of the lateral direct type and 35 (31.8%) of the medial direct type.

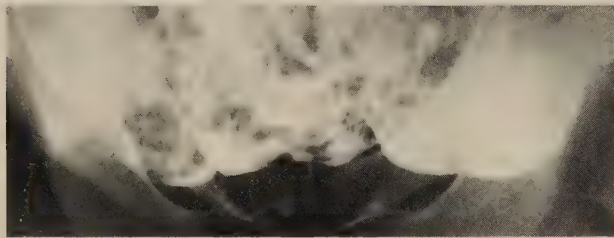
Patients with symptoms of short duration often have the hernia within the inguinal canal and the sac may have the same direction as in indirect hernias (Fig. 16). After some time the superficial ring is disrupted and the sac has a vertical direction (Fig. 18). In more advanced cases the whole posterior wall vanishes with total insufficiency of the groin (Fig. 21). In elderly patients with wide direct hernias the external layer of the wall (the oblique externus fascia) is thinned out, with a common bulging of the groin.

A laterally situated direct hernia with diverticular, narrow neck on first appearance may be difficult to distinguish from a femoral hernia (Fig. 22). However, on oblique views they bulge forward over the inguinal ligament, a femoral hernia, instead, curves backwards below this ligament. The phlebographic test is of special value in their differentiation.

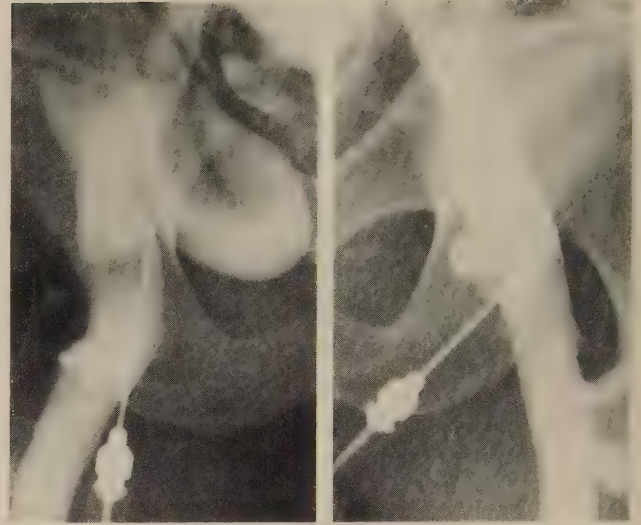
Cases with the sac emerging medially and partly



a



c



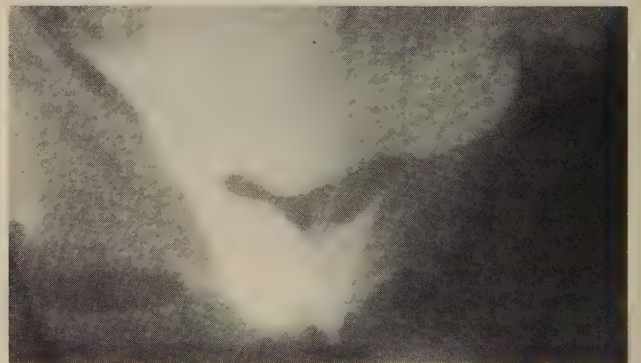
b

Fig. 21. Man 39 years. On straining large bulging of right groin since several years. a) Broad direct hernia, lateral type. Hernia-like deep, broad lateral fossa. b) Phlebographic test indicates fold between the sacs, the site of inferior epigastric vessels. Con-

firmed at operation. c) Repeat examination after McVay operation. Normal findings apart from deep inguinal fossae. Persistent feeling of heaviness in groins.



a

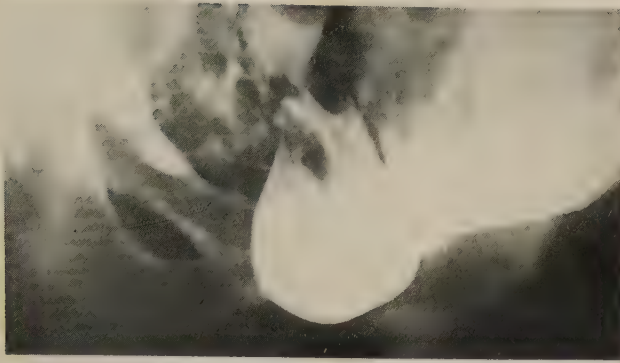


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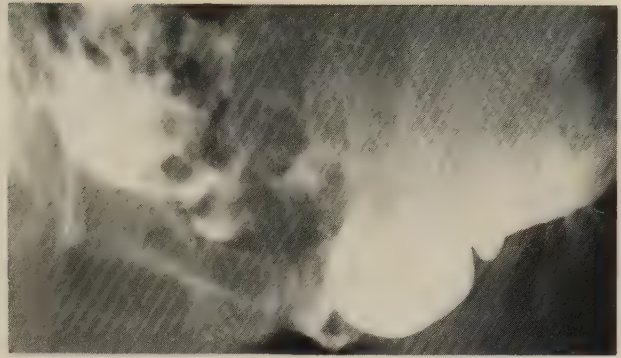
c

Fig. 22. Direct hernia with narrow neck, lateral type. Man 34 years. Pain in right groin and impulse felt on coughing. No hernia palpable. a) Epigastric fold more prominent than umbilical fold, not clearly discernible. This hernia could be erroneously considered as femoral hernia. On projection II (b) sac is seen directed medially and on projection III (c) sac seen to turn forward over inguinal ligament. Phlebographic test normal. Confirmed at operation.



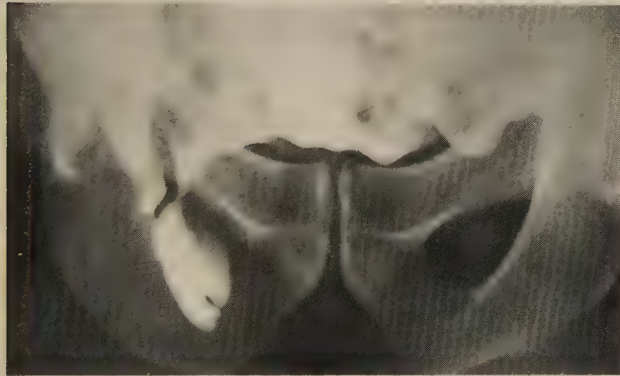
a

Fig. 23. Suprapubic hernia. Man 55 years. Operated upon one year previously in right groin for indirect hernia. Persistent pain in right groin and feeling of distension over symphysis. a) Emerg-



b

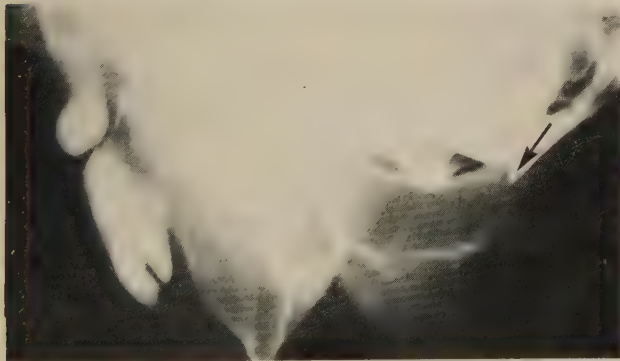
ing from left supravesical fossa suprapubic hernia bulging over to right side. b) On projection II it is observed that the sac really originates from left side.



a



b



c

Fig. 24. Companion hernias. Man 62 years. Small reducible hernia in right groin on straining protruding through superficial ring. Two sacs, in all projections separated only 2 to 3 mm, obviously both lying in inguinal canal: both direct and indirect hernia present. At first operation: only broad-based funnel-shaped direct hernia with double diverticular continuation found. Persistent symptoms: at new operation indirect sac found within spermatic cord. c) On left small funnel-shaped, pointed beak into cord (→).

overlying the symphysis were in this series named suprapubic (Fig. 23). Sixteen such cases were found, of which only one was female. Previously 4 of these cases had been operated upon.

Patients with the narrow-neck type of medial hernia (Fig. 22) may run the risk of incarceration. In 53 patients (5.8%) this type of hernia was present, of these 27 were primary, previously not operated upon. In 26 cases the hernia was recurrent, with

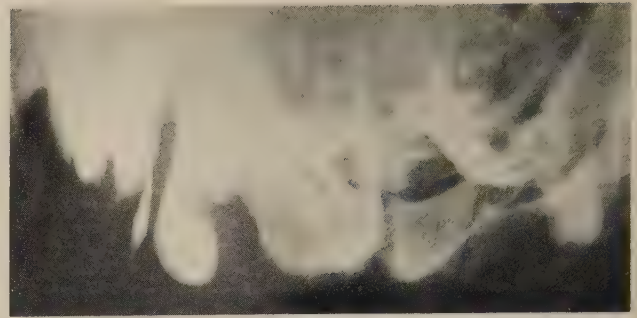
narrow ruptures through the scarred hernioplastic tissues. Some primary cases had a bilobulated sac (Fig. 20) which has been called pantaloons hernia in which the two sacs ride over the lateral umbilical fold (FALLIS 1964). Such cases should also be considered as incarceration risks.

It was a common experience in the present series that only direct hernias produced impulse on coughing. One reason may be that indirect hernias most



a

Fig. 25. Supernumerary direct hernias. Man 59 years. Left side operated upon 13 years previously. Now pain in both groins, sense of swelling in right groin. Recurrent direct hernia of lateral type on left side, most evident in (b), projection III. On right side, 6 hernia pouchings. Medial to lateral umbilical fold a bilobulated

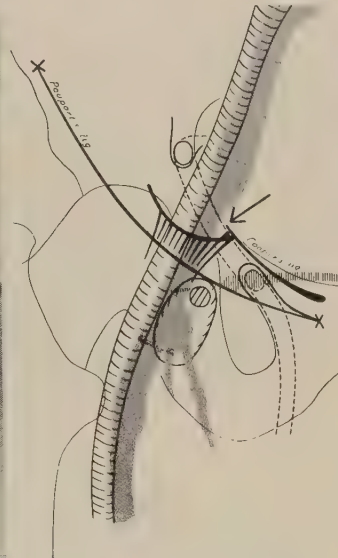


b

sac from supravesical fossa. Next lateral to fold a long, thin protrusion; further laterally, bilobulated direct sac. Also indirect pouching in deep ring. Phlebographic test normal, indicating all sacs being of inguinal type emerging above inguinal ligament.



a



b

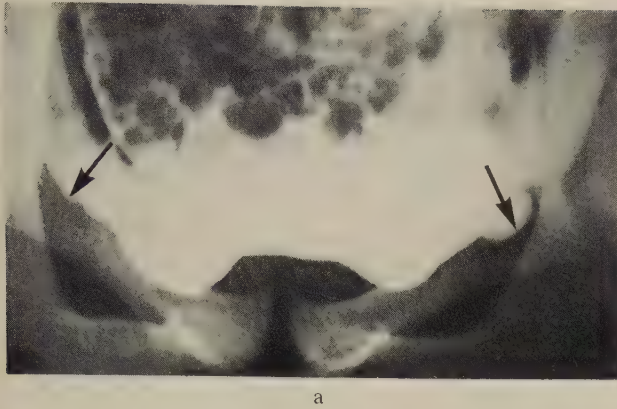
Fig. 26. a) Phlebographic test in normal case. Man 25 years. b) Sketch of important anatomic structures. Arrow at vulnerable space, entrance of femoral canal. Below inguinal ligament in upper part of fossa ovalis, site of emergence of femoral hernia. (From Acta radiol. 47 (1957), 119.)

often have a narrow-necked sac and an intestinal loop in this part may have a buffering effect on the thrust. In direct hernias, pressure variations are transmitted directly through the whole sac. The importance of due consideration to the herniographic findings at operation is demonstrated in Fig. 24. The surgeon was aware that there should be two sacs and found one sac with double bottom. The spermatic cord was of normal appearance and not opened. However, the symptoms remained and after re-examining the films the indirect sac was found at a new operation.

A case with no less than 6 hernial pouchings on the right side is illustrated in Fig. 25. The lateral umbilical fold is lateral to the largest sac, which is a bilobulated direct hernia of medial type. Lateral to this fold is a long but very narrow sac which sometimes occurs next to this fold.

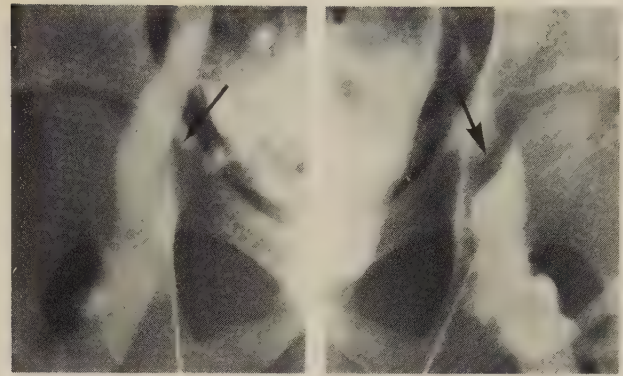
9. FEMORAL HERNIA

Femoral hernias are known to be relatively more common in females and to have a high strangulation frequency (BURTON 1960, KOONTZ 1964, DENNIS & ENQUIST 1978). This type of hernia passes under the inguinal ligament through an opened femoral canal, which in normal cases is only a potential space medial to the femoral vein. The sac emerges through a dilatated femoral ring which is a sling of the transversalis fascia (HOLLINSHEAD 1971) around the medial part of the femoral vein (Fig. 26 b). Femoral hernia has no congenital peritoneal predisposition but the femoral ring is wider in cases with weak attachment of the transversalis fascia to the pelvic border (MURRAY 1910, PANTON 1923, TASCHE 1932, MCVAY & SAVAGE 1961, ANSON & MCVAY 1971, HOLLINSHEAD 1971, 1974, CONDON 1978, NYHUS 1978). The theory of KEITH (1923) that pressure variations in the femoral vein could have a hammering effect on its surroundings, a possible femoral canal, was adopted by MCVAY & SAVAGE (1961). Any straining effort causes an impulse on the femoral vein which may have a widening effect on the femoral ring (MONRO 1974). A local accumulation of fat may also be the result of this effect and can be forced down into the femoral canal as a wedge and pave the way for a hernial pouching. ANSON &



a

Fig. 27. Incipient femoral hernias. Man 23 years. Pain in left groin for two months. a) Small incipient femoral pouchings, both sides (→). Largest on left side. b) Filled also in supine position during phlebographic test. Typical compression phenomenon on left



b

side. Incompetence of medial circumflex femoral vein. Findings confirmed at Nyhus operation on left side, some lipomatous tissue in front of sac.

MCVAY (1971) point to this factor of etiology as the lipoma theory of Cloquet. They hold it for certain that a battering ram of fat always precedes the formation of the peritoneal diverticulum of a femoral hernia.

In a large series published by GLASSOW (1973) the femoral canal was regularly examined at every inguinal hernia repair resulting in 4874 cases with femoral hernia found at 69964 operations. The author admits, however, that more than one half of those cases classified as femoral hernia were actually fatty tabs. Much attention has been paid to the transversalis fascia and aponeurosis which is the strengthening and supporting stratum next outside the peritoneum (MCVAY & ANSON 1940, 1942, CONDON 1964, 1978, MCVAY 1965, 1978, NYHUS 1964a, b, NYHUS & HARKINS 1978, LINDHOLM et coll. 1969, LJUNGDAHL 1978). The femoral sheath is a derivate of this fascia and is of special importance in protecting the vein on its entrance into the abdominal cavity (BURTON 1960, 1964). In cases with a weak and narrow insertion of the posterior inguinal

wall on Cooper's ligament on the pelvic border (Fig. 3c), often a broad infundibular bulging down against the femoral ring exists. BURTON (1960) called this an incipient combined direct inguino-femoral hernia. Based on this recognition he suggested that femoral hernia should be looked upon as a variant of inguinal hernia. The same suggestion was made by HALVERSON & MCVAY (1970) and NYHUS & BOMBECK (1972). The classical dividing into three types of groin hernias is so common that it would seem better to consider this intermediate type of hernia as a variant of femoral hernia.

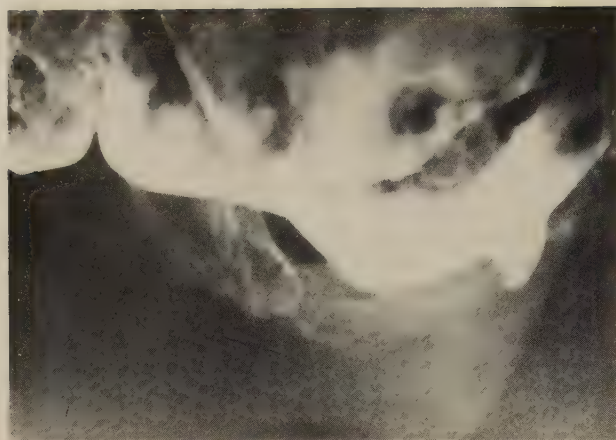
BURTON (1960) emphasized that the high frequency of strangulation of femoral hernia made it desirable to diagnose this type of hernia in its preclinical stage of incipient hernia.

After a preliminary description of the compression phenomenon of the femoral vein (GULLMO 1956), further analysis of the conditions and origins of femoral hernia was reported (GULLMO 1957). Under the influence of statements by MCVAY & ANSON (1942, 1949) and BURTON (1949, 1954, 1956) special

Table 6

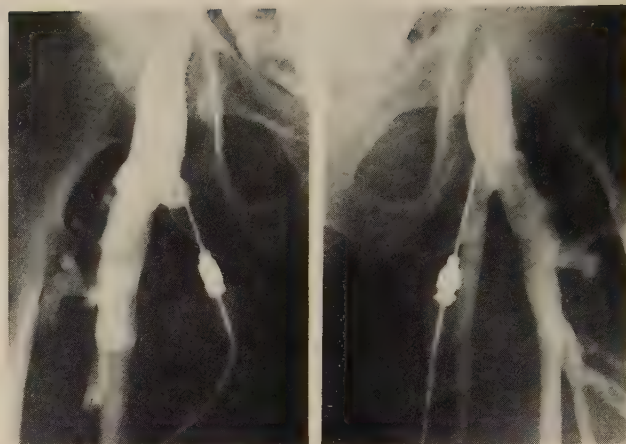
Number of additional direct hernial sacs on the same side, on the contralateral side or on both sides in cases with a direct hernia on the right side. The 2 groups of lateral and medial types are considered

Right side	Additional sacs on same side (right)	Contralateral side (left)			
		Lateral type	Medial type	Combined broad type	Total
Direct hernia, lateral type: 139 cases	20 (medial type)	51	23	5	99
Direct hernia, medial type: 110 cases	20 (lateral type)	27	35	1	83



a

Fig. 28. Woman 58 years. Many years, pain in left groin. More than 10 years ago, spontaneous thrombosis in left leg. a) Typical incipient femoral hernia seen only in oblique projection III. b)



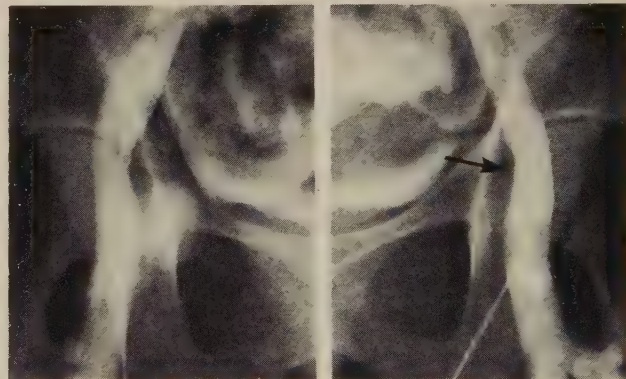
b

Compression phenomenon on left side, also post-thrombotic changes in femoral vein and some incompetence of long saphenous vein. Confirmed at McVay operation.



a

Fig. 29. Complete femoral hernia, Woman 29 years. Small reducible hernia in right groin. a) Typical pear-shaped femoral hernia with narrow neck. Funnel-shaped entrance over pelvic border. Fundus of sac on stereoscopy seen to have anterior direction from below the inguinal ligament. b) Only minor encroachment on



b

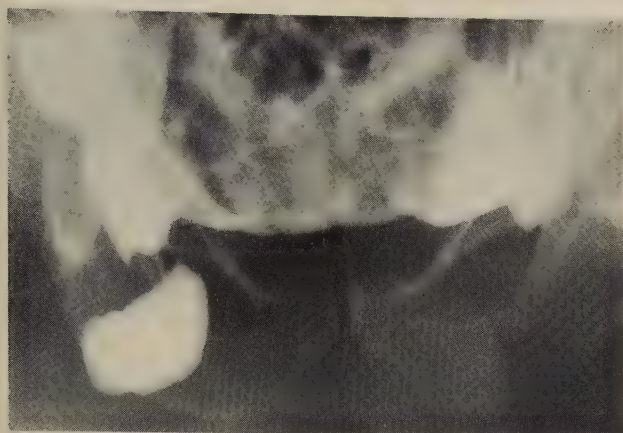
vein on straining, confirmed at operation. Neck of sac dense and fibrous. Left side, slight bulging into 'vulnerable space' (→). Right side, the hernia reduced before puncture of vein, therefore incompletely filled in supine position.

interest was directed to the 'vulnerable space' medial to the femoral vein (Fig. 26). The compression phenomenon was considered to indicate weakness in the ligamentous support of the vein on its passage through the lacuna vasorum under the inguinal ligament. The femoral vein passes over the pelvic border in the femoral canal, which is 2 to 3 cm long. The compression phenomenon corresponds to this site (Fig. 27) and occurs only on straining. A pushing down of a hernia or of lipomatous fat in this canal was the usual cause of the compression. It was proved that it could be alleviated with the hernioplastic methods that paid particular attention to the near surroundings of the femoral vein. The widened

femoral canal must be closed by apposition of the posterior wall to Cooper's ligament and is carried out in the McVay operation and also in the preperitoneal approach of Nyhus (Fig. 3c). A special transition suture was recommended by MCVAY (1966) for the repair and return of the femoral ring to its normal size.

In the present series hernias located in the femoral canal were divided into three groups or stages (Table 7).

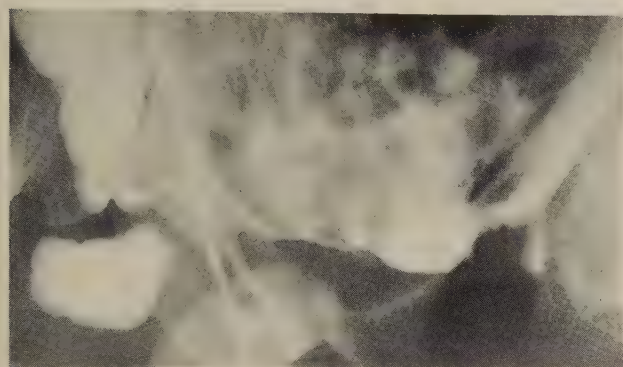
The first stage comprises incipient femoral hernia with a moderate bulging down into the femoral canal (Figs 27, 28). Such hernia often caused pain in the groin and therefore were frequently operated upon



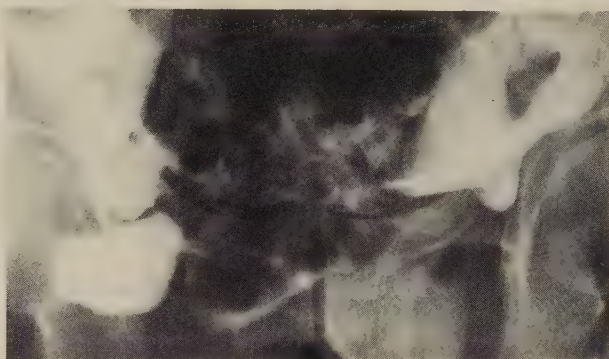
a



b



c



d

Fig. 30. Man 47 years. Small hernia below inguinal fold, reducible with some difficulty. Femoral hernia with narrow neck in lower part of femoral canal. Incipient femoral hernia on left side. The 4

standard projections show funnel-shaped emergence related to pelvic border.

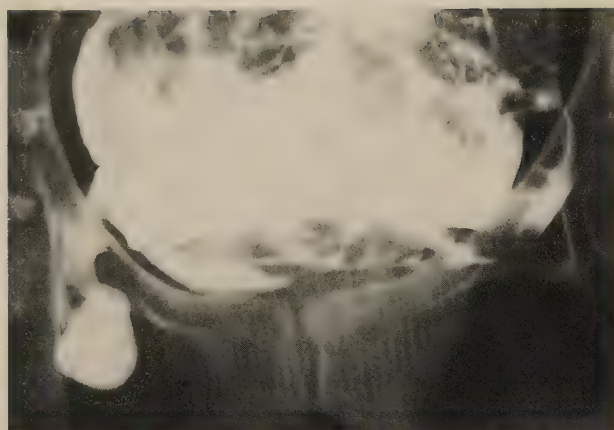
(Table 8). They were often found to be surrounded by localized lipomatous tissue. There is reason to believe that this is also the cause of the frequent compression of the vein in cases with only an in-

cipient femoral hernia (Table 9). At operation these cases are also classified as femoral hernias. At herniography it is easy to distinguish between incipient and fully developed femoral hernias.

Table 7

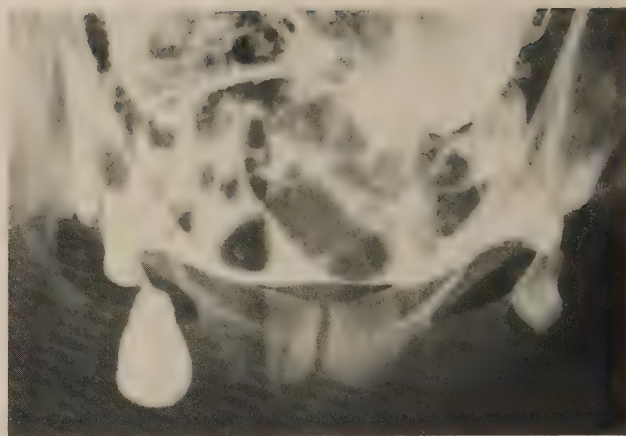
Frequency of the 3 types of hernia affecting femoral canal in different age groups. Males (M) and females (F)

	Age groups (years)														Total		
	10-19		20-29		30-39		40-49		50-59		60-69		70-79			80-	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F		M	F
Right																	
Incipient femoral	0	0	7	1	6	3	2	2	2	4	7	4	0	1	0	0	39
Complete femoral	0	0	0	1	0	6	4	0	2	4	4	8	2	2	0	0	33
Inguino-femoral	0	1	6	6	17	9	21	12	29	21	22	15	13	8	1	1	182
Total	0	1	13	8	23	18	27	14	33	29	33	27	15	11	1	1	254
Left																	
Incipient femoral	0	0	3	0	4	2	2	3	5	5	8	5	1	1	0	0	39
Complete femoral	0	0	0	0	0	1	2	0	1	2	2	0	1	1	1	0	11
Inguino-femoral	1	1	6	1	9	4	12	2	21	5	15	7	8	1	0	0	91
Total	1	1	9	1	13	5	16	5	27	12	25	12	10	3	1	0	141



a

Fig. 31. Woman 58 years. a) Typical femoral hernia filled during injection in supine position. b) On straining in prone position,



b

femoral hernia also filled on left side. Typical protrusion over pelvic border. Also small indirect hernia lateral on right side.

The second stage consists of complete passage of the sac through the femoral canal (Figs 29–32). As a rule the sac is palpable below the inguinal fold. These fully developed femoral hernias are of two types. Most typical is a pear-shaped sac with a narrow neck passing the femoral canal (Figs 29, 32, 83). The sac was at operation in such cases found to have a dense and fibrous neck which could not be distended. Therefore, the phlebographic test is often almost normal in spite of the hernia passing directly on the medial side of the vein (Fig. 29b). On oblique or stereoscopic films they are seen to curve posteriorly behind and below the inguinal ligament (Fig. 30). The entrance of the sac into the femoral canal is typically funnel-shaped and corresponds to the pelvic border, which is the posterior boundary of this canal.

Femoral hernias are the most posteriorly situated hernias in the groin, which is the reason they often fill with contrast medium in the supine position dur-

ing injection (Fig. 31). Some cases with clinical findings of a hard and irreducible nodal resistance in the groin were found, surprisingly, to be femoral hernias with a very narrow neck of the sac (Fig. 32). They were nevertheless easily filled because of no visceral content. The irreducibility may be due to the fact that the long and narrow neck is probably kinked on pressure.

The second type of complete femoral hernia has a broad-based sac with considerable widening of the femoral canal (Fig. 33) and is most common in elderly women. At phlebography the sac is found to be in close connection to the femoral vein, which fact can be of value in the diagnosis (Figs 33, 34). Direct inguinal hernia of the lateral type could have the same appearance. Femoral hernias of this type are often accompanied by the compression phenomenon of the femoral vein. The degree of dilatation of the femoral ring and canal may determine the compression.

Table 8

Number of cases confirmed at operation in the 3 groups of hernia affecting the femoral canal

Hernia	Right			Left		
	Total	Operated upon	Per cent	Total	Operated upon	Per cent
Complete femoral	33	24	72.8	11	7	63.6
Incipient femoral	39	17	43.6	39	19	48.7
Inguino-femoral	137	33	24.1	91	29	31.9

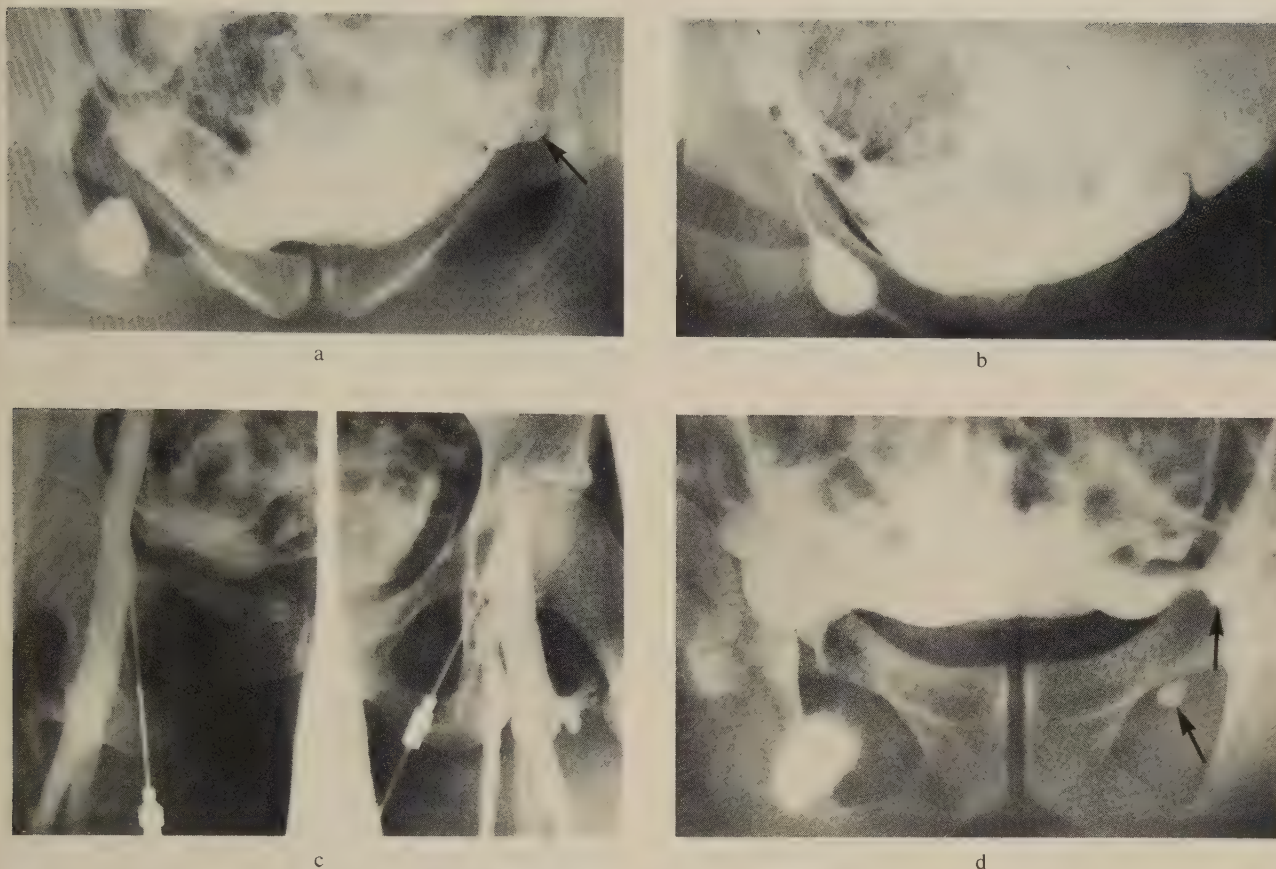


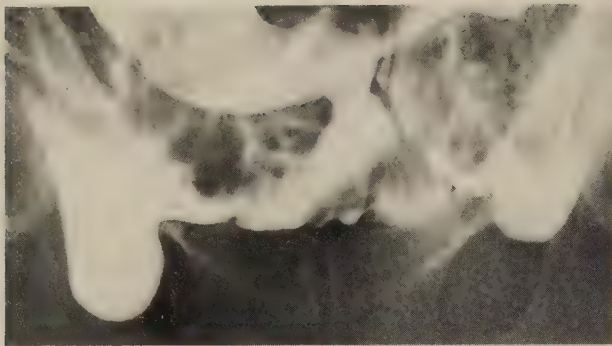
Fig. 32. a-c) Woman 31 years. Small painful irreducible node in right groin. a, b) Sac easily filled but could not be emptied again by pressure. Long narrow neck of sac possibly kinked on palpation. On left side, small incipient femoral hernia (→) caused compression on femoral vein (c). At operation on right side the long neck was stiff and fibrous and at some distance to vein. It was moderately surrounded by fat not impeding the vein, which

probably is the cause to only slight compression of the vein. Presumably more lipomatous fat on left side. d) Man 40 years. Typical femoral hernia on right side with marked protrusion over pelvic border. On left side, filling of femoral hernia similar to the case in a-c with narrow, long neck in femoral canal. On right side confirmed at operation.

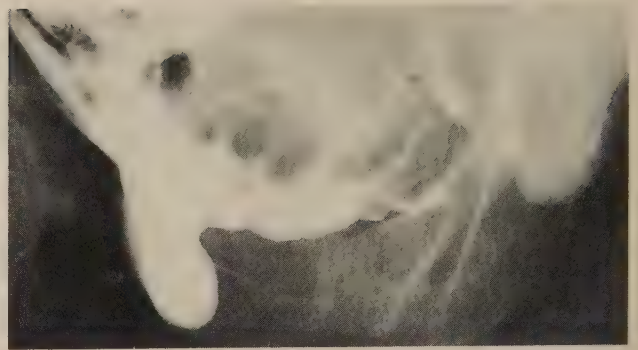
Table 9

Frequency of compression phenomenon (CP), impression and deviation (I+D) and normal (N) appearance of femoral vein in the 3 groups of hernia affecting femoral canal. Numbers in parentheses represent patients not examined with phlebographic test

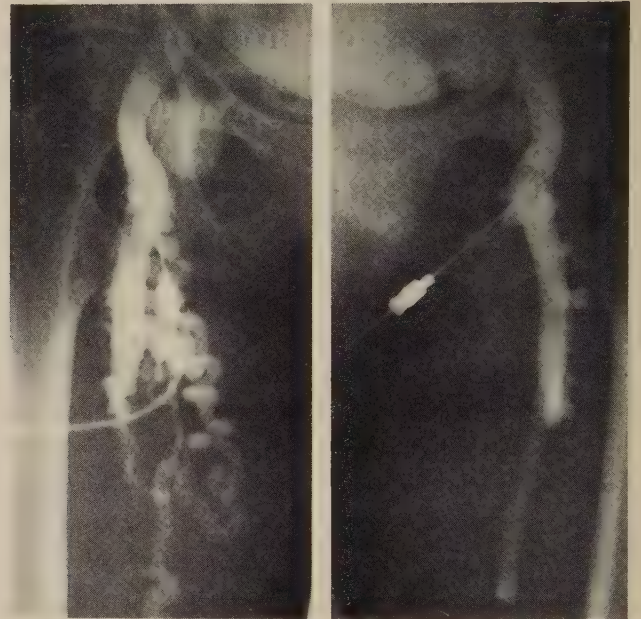
Hernia	Right				Left			
	Total	CP	I+D	N	Total	CP	I+D	N
Complete femoral	33	8	24	1	11	3	7	0 (+1)
Per cent		24.2	72.7	3.0		27.3	63.6	—
Incipient femoral	39	18	17	4	39	22	15	2
Per cent		46.2	43.6	10.3		55.4	38.5	5.1
Inguino-femoral	137	81	47	7 (+2)	91	55	28	6 (+2)
Per cent		59.1	34.3	5.1		60.4	30.8	6.6
Total	209	107	88	12	141	80	50	8
Per cent		51.2	42.1	5.7		56.7	35.5	5.7
		93.3				92.2		



a

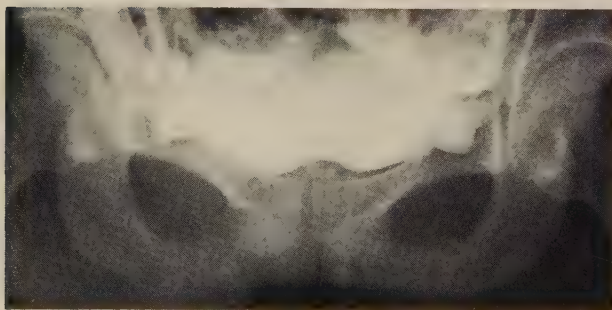


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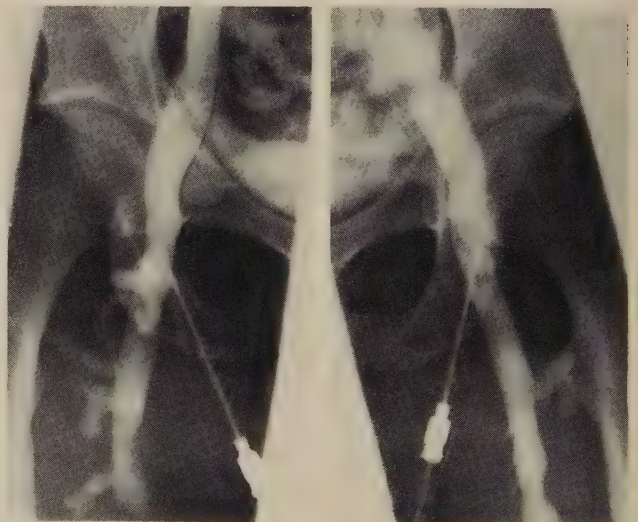


c

Fig. 33. Broad-based femoral hernias. Woman 69 years. On right side, large reducible hernia below inguinal fold. a, b) Broad-based femoral hernias on both sides, not palpable on the left. Syndrome of broad fossae with medial displacement of umbilical folds. c) Close connection of sac and vein on right side. Recurrent varicosity following operation of long saphenous vein.



a



b

Fig. 34. Incipient femoral hernias. Woman 24 years. Often noticed pain and sense of bubbling in right groin. a) Incipient femoral hernias on both sides. b) On right side the hernia is most evident in supine position at phlebographic test. It exactly follows the medial wall of the vein.

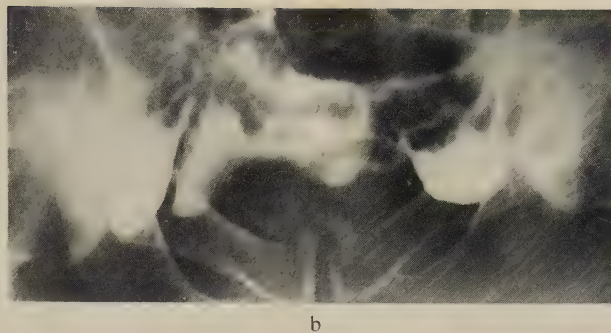
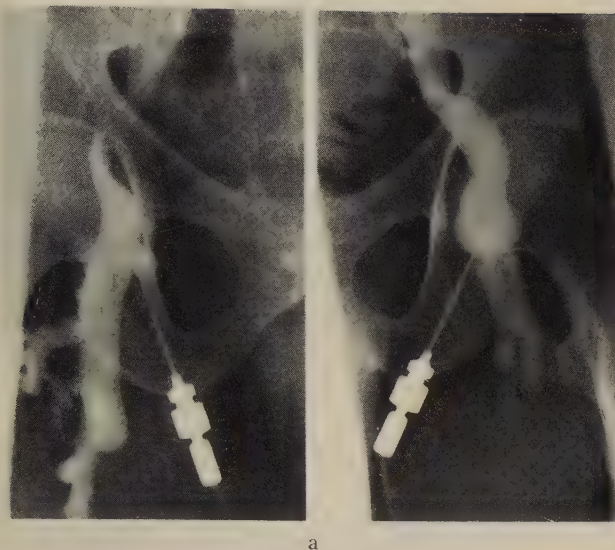


Fig. 35. Inguino-femoral hernias. Man 50 years. Pain in groins thought to be caused by prostatitis. a) Compression phenomenon on right side and mechanism of Keith on the left with supra-valvular dilatation of vein. b) Inguino-femoral hernia of lateral type on right side. The sac has same direction as femoral vessels. Left side, broad direct hernia of lateral type with the sac also partly involving near surroundings of femoral vein. Prostatic tuberculous calcifications.

In the series of HSG pelvigraphy incipient femoral hernias of a rather broad-based type were often found (Fig. 34), probably they develop into this type of broad femoral hernia.

The frequency of bilateral femoral hernia of various types is given in Table 10. The type present on one side will in most cases also be found on the con-

tralateral side. This may indicate that individual predisposition exists.

10. INGUINO-FEMORAL HERNIA

This type of hernia, a third variant of femoral hernia, includes besides a femoral bulging also part

Table 10

Frequency of bilateral hernial abnormalities affecting femoral canal

Right side	Number of cases	Contralateral (left)			
		Incipient femoral	Complete femoral	Inguino-femoral	Total contralateral
Complete femoral	33	7	6	5	18
Per cent		21.2	18.2	15.2	54.5
Incipient femoral	39	13	0	4	17
Per cent		33.3	—	10.3	43.6
Inguino-femoral	137	7	4	37	48
Per cent		5.1	2.9	27.0	35.5
Total	209	27	10	46	83
Per cent		12.9	4.7	22.0	39.7
Left side		Contralateral (right)			
Complete femoral	11	0	6	4	10
Per cent		—	54.5	36.4	90.3
Incipient femoral	39	13	7	7	27
Per cent		33.3	17.9	17.9	69.2
Inguino-femoral	91	4	5	37	46
Per cent		4.4	5.5	40.7	50.5
Total	141	17	18	48	83
Per cent		12.1	12.8	34.0	58.9

of one of the medial fossae. The umbilical fold curves upwards just over or near the outlet of a possible herniation into the femoral canal. The fold seems to be directive also for this intermediate type of hernia. It is possible to distinguish between lateral (Fig. 35) and medial (Fig. 36) inguino-femoral hernias. For the same reason as in common femoral hernias they are often filled in the supine position (Fig. 36). They are sometimes very broad-based, infundibular, but still their lower part points in the same direction as the femoral vein (Fig. 37).

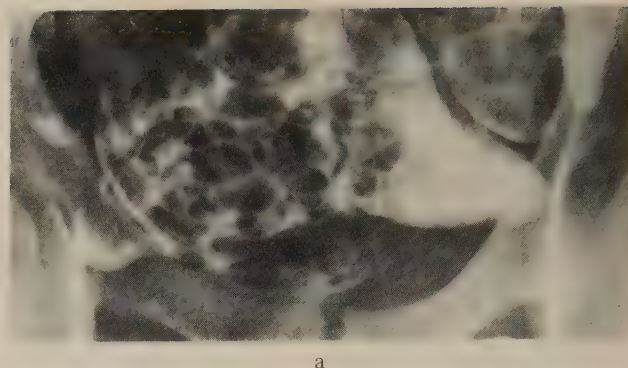
This intermediate type of hernia was the most common type affecting the femoral canal (Tables 7, 8). It was most frequent in the sixth decade of life (Table 7). It was also found in young sportsmen (Fig. 36, Table 11) and in those with heavy work. In the HSG series of young women it was the most common of hernial abnormalities in the groins, followed by incipient femoral hernias (Table 15).

This type of hernia was the most common cause of compression phenomenon of the femoral vein (Fig. 35, Table 9). It is also often accompanied by incompetence of the medial circumflex femoral vein (Fig. 37), its wide and extended contact with the femoral sheath possibly being the reason.

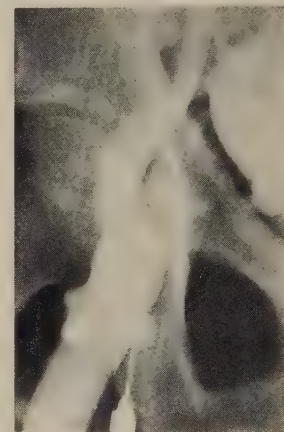
11. LIPOMA IN THE FEMORAL CANAL

It is well known that femoral hernias are often preceded and surrounded by lipomatous fat (BROOMÉ 1957). It has been called *hernia adiposa* (ANSON & MCVAY 1938) and in French *lipome herniaire* (CAUBET 1903, JABOULAY & PATEL 1908, KEITH 1923). NYHUS (1978) assumed that repeat intra-abdominal pressures will accumulate fat into the femoral ring. A bolus of fat will then drag along a pouch of pelvic peritoneum to develop a femoral hernial sac.

In a few cases direct observation of such a femoral hernial lipoma was possible at herniography (Figs 38, 39). It was observed to move like a piston down into the femoral canal on straining (Fig. 38). In one case (Fig. 39) it was palpable in the same manner as a reducible femoral hernia. At operation of this case only small pointed extensions of the peritoneum were found behind the lipomatous mass at the outlet site of the femoral hernia (Fig. 39). The same findings were later made in other cases. These appearances seem to indicate a prehernial lipoma. In the autopsy series two cases were found with fatty tabs bulging into the abdominal cavity and continuing down into the femoral canal (Fig. 40 a).



a



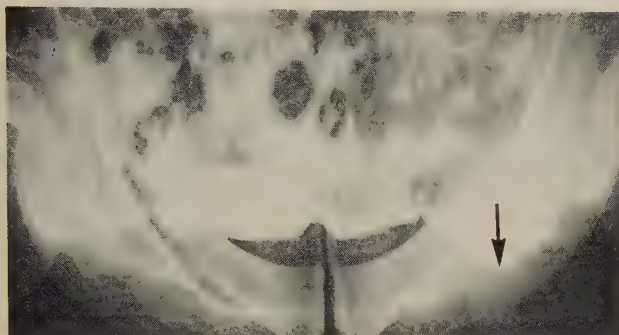
b

Fig. 36. Man 34 years. Champion handball player, pain in both groins prohibited playing. a) Medial type inguino-femoral hernia, both sides. b) On right side the hernia moderately compresses vein on straining. Findings confirmed at bilateral (Nyhus) preperitoneal hernioplasty.

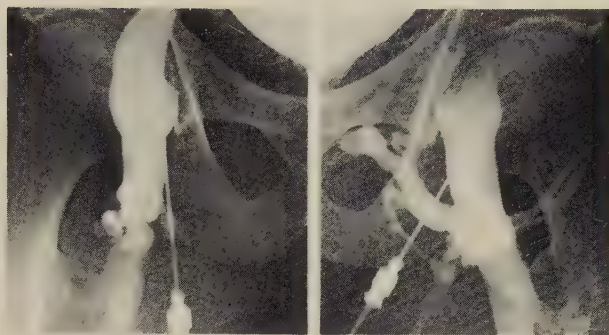
There seems to be a common tendency to preperitoneal fat accumulation at the site where the femoral vessels pass over the pelvic border. This was demonstrated in a case with inadvertent contrast injection into the preperitoneal space behind the transversalis fascia (Fig. 41). The relation of the fat pad to a potential femoral canal was also demonstrated in this case. Probably hernial lipoma can be diagnosed by ultrasound. However, small hernial sacs which often accompany lipomas will not be discernible at ultrasound examination.

12. PHENOMENON OF KEITH

KEITH (1923) gave on theoretic assumptions a description of a phenomenon (which later has been called after him) as a possible cause of femoral hernia. This phenomenon was discussed previously (GULLMO 1957). The proximal valve in the femoral vein, also called the sub-poupartian valve, is constantly located just below the inguinal ligament (Figs 42, 43). More proximally in the lower caval system



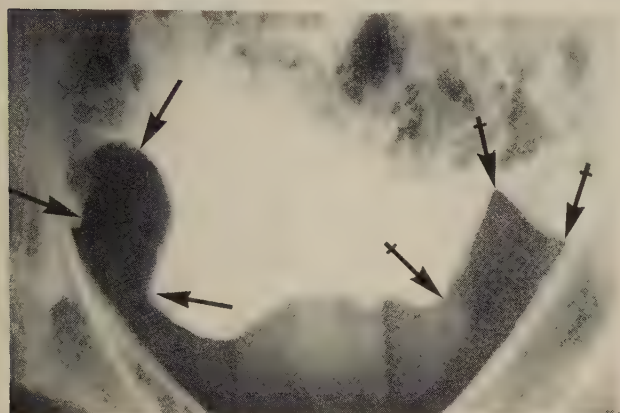
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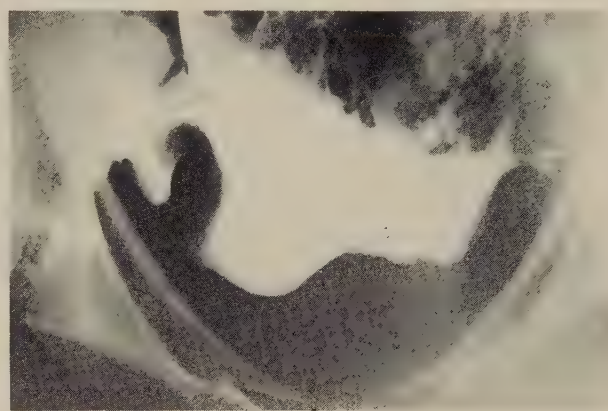
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Fig. 37. Man 36 years. Pain in left groin. a) Left side broad-based inguino-femoral hernia of lateral type. Lower point directed along femoral vessels (→). b) Left side, compression phenomenon and

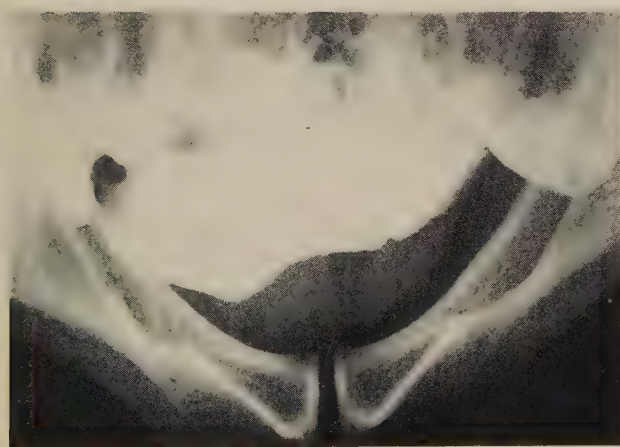
incompetence of medial circumflex femoral vein. Right side, Keith mechanism.



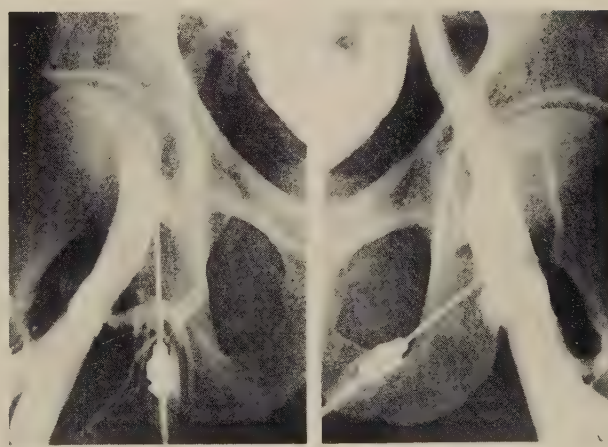
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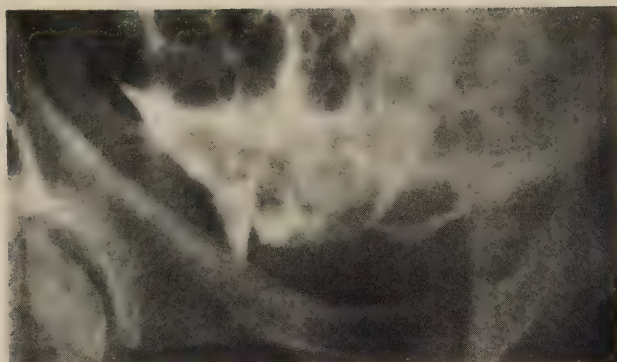
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Fig. 38. Fatty tab. Man 32 years. Pain and sometimes soft swelling in right groin. a) Protruding lipoma over outlet site for femoral hernia (→), no straining. b, c) Varying degree of straining. On very hard straining (c) lipoma almost disappeared down into femoral canal. Broad, fatty umbilical fold (↔), on left side also

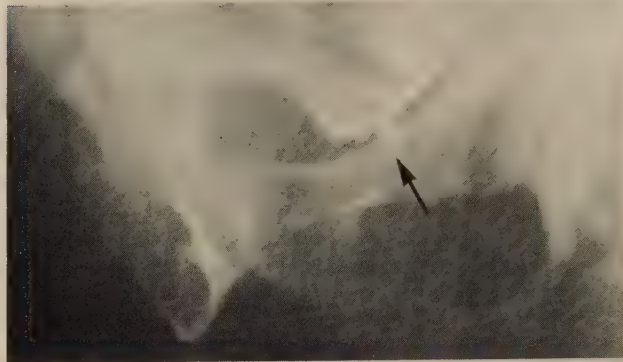
flattening. d) Corresponding compression of femoral vein on right side, slight incompetence in medial circumflex femoral vein. Findings on right side confirmed at operation (McVay hernioplasty).

valves are found extremely seldom. In the phlebographic series of 1010 patients, only one case had valves in the external iliac veins (bilateral). Pressure thrusts in the lower caval system therefore have

their greatest impact in the femoral canal. This seems to be the reason of a marked supra-valvular dilatation of the femoral vein in the femoral canal sometimes observed at phlebography (Figs 42, 43).



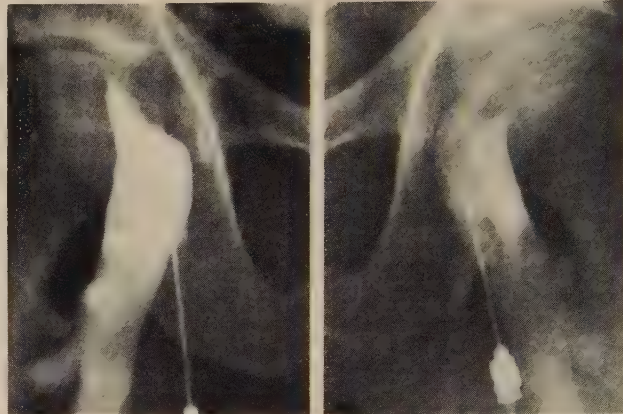
a



b



c



d

Fig. 39. Hernia lipomatosa. Man 64 years. Painful reducible mass in right groin. a) Beak-shaped protrusion directed into femoral canal, discernible only on oblique projection II. No real hernial sac. b) Same findings on left side. c) Late in examination when most of contrast medium was absorbed and after reduction of mass, lipoma is observed, on straining moving down through

femoral canal. d) Right side, typical compression on medial side of vein on straining. Left side: more of frontal compression presumably from lipoma more anterior to vein and preceding beak-shaped peritoneal protrusion. At operation on right side, large lipoma removed from femoral canal, much dilated. Thorn-shaped peritoneal extension dragged into fatty mass also observed.

In the herniography series 8 patients presented an evident phenomenon of Keith on the right side and 28 on the left. Six of these 28 had complete compression of the vein on the contralateral right side and an additional 12 patients had an evident but not complete compression (Fig. 42). Probably, the phenomenon of Keith is the first stage in the development of incompetence and widening of the femoral canal. It may later be followed by a second stage of accumulation and protrusion of lipomatous fat in the widened canal. KEITH observed that fat, in the living body, is a semifluid substance which may enter the potential space in the femoral canal if distended by the femoral vein. This bolus of fat may pave the way for the third stage, a real femoral hernia with a peritoneal sac (NYHUS 1978), which is often found preceded and surrounded by fat.

13. SYNDROME OF BROAD AND DEEP FOSSAE

This syndrome indicates an incompetence of the inner transversalis layer. The lateral umbilical ligament, the fibrous rest of the umbilical artery, elevates the peritoneum appearing as the umbilical fold. It is also attached to the overlying transversalis fascia. Direct hernias protrude through ruptures and impairments of this transversalis aponeurosis and fascia. Accordingly, a displacement of the umbilical fold, in most cases medially, often occurs in this type of acquired hernia (Fig. 44).

In many cases with pain in the groin no real hernial sac existed but, instead, a very broad and deep fossa occupying the entire groin, including the lateral fossa, and often extending over the midline (Figs 45 d,



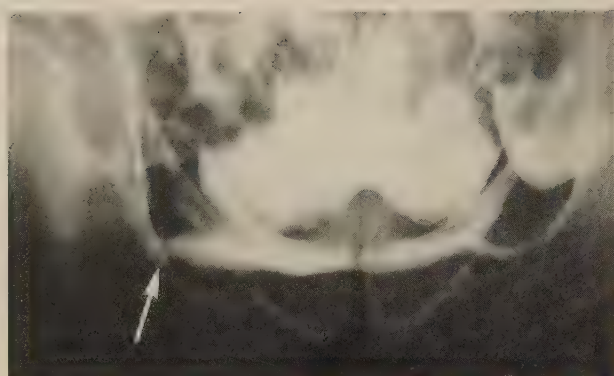
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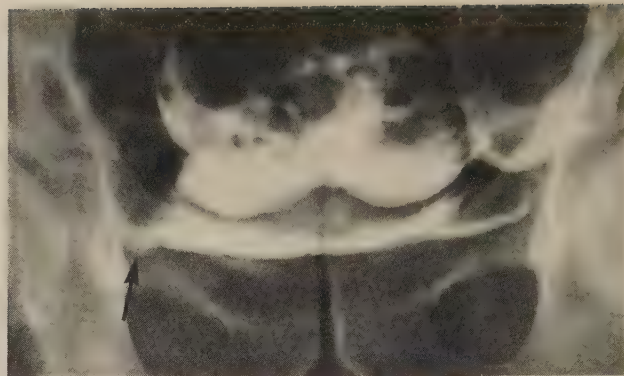
b

Fig. 40. Autopsy cases. a) Woman 76 years. Right side, a fatty tab medial to umbilical fold continuing down into small pelvis and paralleling medial side of femoral vein. Lipoma filling the dilated femoral canal. b) Woman 73 years. Broad opening for incipient femoral hernia (F), palpated below inguinal ligament. Lateral fossa rather deep (L). Epigastric fold continues along femoral

vessels (E). Umbilical ligament (U) from small pelvis disappearing into preperitoneal fat. Round ligament (→) disappears into deep ring above inguinal ligament. Supravesical fossa (S) medial to umbilical ligament normal. Medial fossa (m) not evidently outlined. Inguino-femoral depression occupying medial fossa.



a



b

Fig. 41. Inadvertent contrast filling of preperitoneal space. Man 46 years. Corpulent, pain over symphysis. Catheter had passed anterior to peritoneum in this rather fat abdominal wall, injection of contrast medium between peritoneum and transversalis fascia. a-c) Repeat puncture resulted in demonstration of both preperitoneal space and herniography. Accumulations of covering fat in 'vulnerable space', most evident on left side under lateral umbilical fold. On right side small protrusion into femoral canal (→). c) At phlebography slight extravasation on right side producing exact demonstration of compressed area medial to vein (between ↔).



c

Table 11

Frequency of inguinal abnormalities found in 50 sportsmen and athletes with pain or distress in the groins. Only 3 had quite normal findings

	Right	Left
Direct hernia, lateral type	20	16
Direct hernia, medial type	13	1
Direct hernia, combined broad type	5	0
Indirect hernia, complete, stage 4	1	3
Indirect hernia, incipient, stage 3	0	3
Femoral hernia, complete	0	0
Femoral hernia, incipient	3	1
Inguino-femoral hernia	9	2
Broad inguinal fossa	14	10
Total compression of femoral vein	9	2
Moderate compression and deviation	18	22

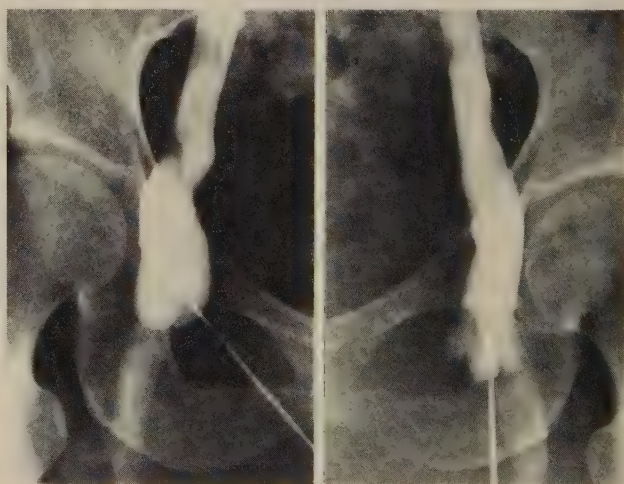


Fig. 42. Mechanism of Keith. First stage. Man 34 years. On right side, supraclavicular dilatation of vein corresponding to femoral canal. Left side normal. Only slight lateral deviation of vein on straining.

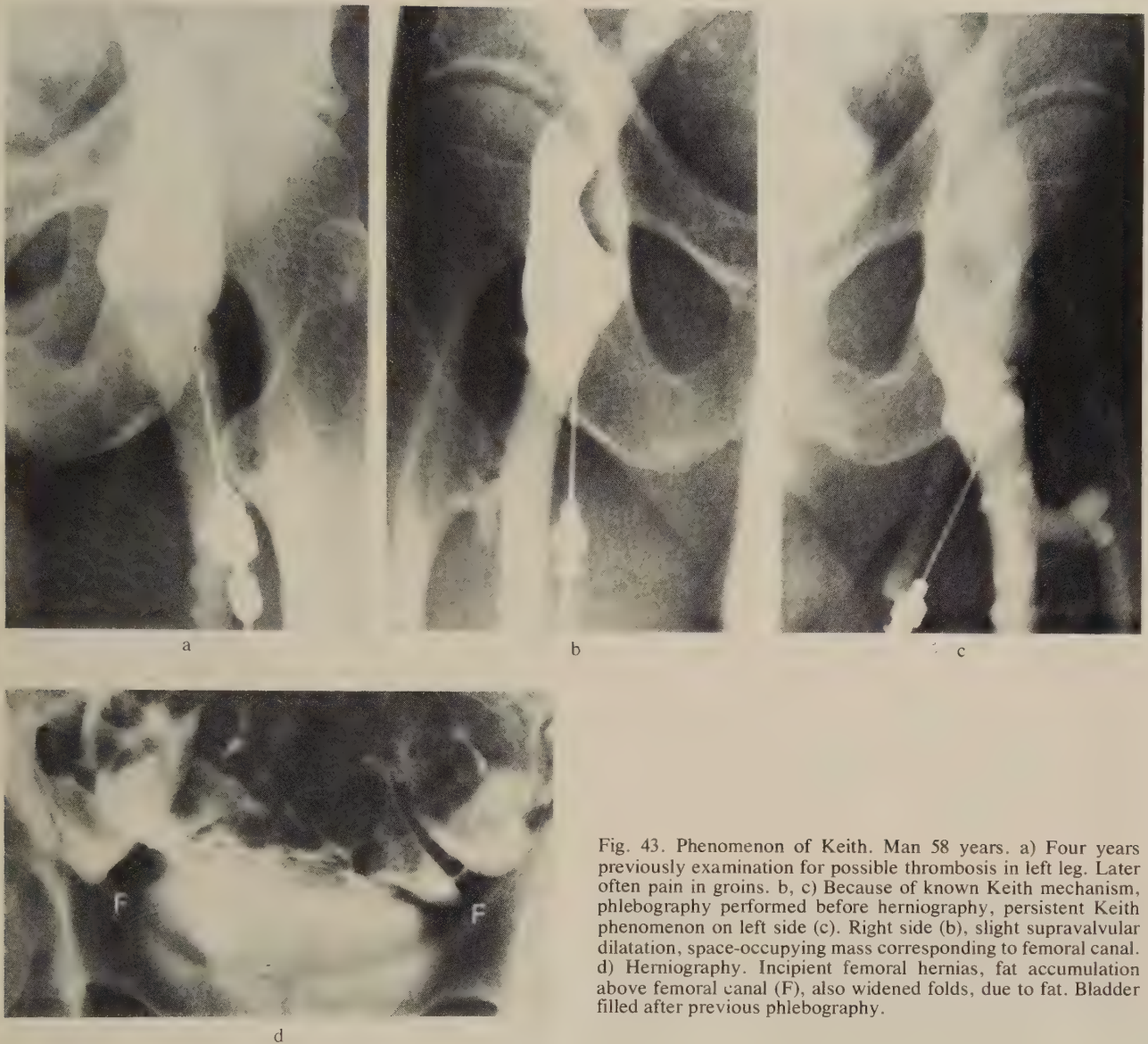


Fig. 43. Phenomenon of Keith. Man 58 years. a) Four years previously examination for possible thrombosis in left leg. Later often pain in groins. b, c) Because of known Keith mechanism, phlebography performed before herniography, persistent Keith phenomenon on left side (c). Right side (b), slight supraclavicular dilatation, space-occupying mass corresponding to femoral canal. d) Herniography. Incipient femoral hernias, fat accumulation above femoral canal (F), also widened folds, due to fat. Bladder filled after previous phlebography.

46). A localized rupture can sometimes appear as a pointed tip of the contour, often directed towards the femoral canal (Fig. 45 b). On oblique films a separate inguino-femoral bulging is often found behind the broad fossa (Fig. 46 b).

The medial displacement of the umbilical fold is obviously caused by attenuation and weakness in the transversalis layer. This corresponds with its increasing frequency with advancing age (Figs 46, 47).

In the present series the umbilical fold was evidently displaced medially in 345 patients (37.7%), in 174 bilaterally, on the right side in 251 cases (27.5%) and on the left in 268 (29.3%). Admittedly many of

these cases were not marked. Cases with severe symptoms could be totally symptom-free after hernioplasty using Cooper's ligament. At postoperative herniography the umbilical fold was found to be either smoothed out or stretched resulting in a more normal appearance. Many of these cases also had a localized hernial sac repair and could not be clearly evaluated as to the special importance of the fossa syndrome (Fig. 21).

The correlation between the broad fossa and transversalis layer incompetence was also demonstrated at phlebography. A high frequency of the compression phenomenon (Figs 44, 46) was found, which indicates incompetence of the femoral

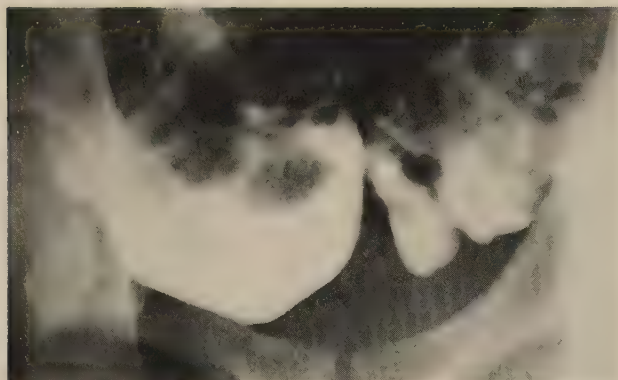


Fig. 44 a



Fig. 44 b

Fig. 44. Acquired hernia (rupture) in a young sportsman (football, soccer) 24 years old. Severe pain in right groin. No hernia palpable. a) In projection I heavy bulging on right side of broad fossa type. b) Oblique projection III, large medial direct sac demarcated with medially displaced umbilical fold (→). c) Compression phenomenon on right side. At operation, ruptures of posterior wall (transversalis layer) of inguinal canal. Medially displaced lateral umbilical ligament. After Cooper's ligament repair patient symptom-free. After 2 weeks left-sided operation, on which also ruptures as well as weakening and thinning of transversalis layer were found.



Fig. 44 c

Fig. 45. Four cases of broad fossae with somewhat different appearances. a) Man 30 years. Pain in both groins. Moderately deepened fossae and slight medial displacement of umbilical folds. b) Man 48 years. Pain in right groin. Very high umbilical folds, on right side beak-shaped protrusion against femoral canal (moderate compression of vein). c) Man 46 years. Pain in both groins. Almost total displacement medially of umbilical folds (→). d) Man 63 years. Pain in left groin. Broad fossa on left side overriding midline (→).

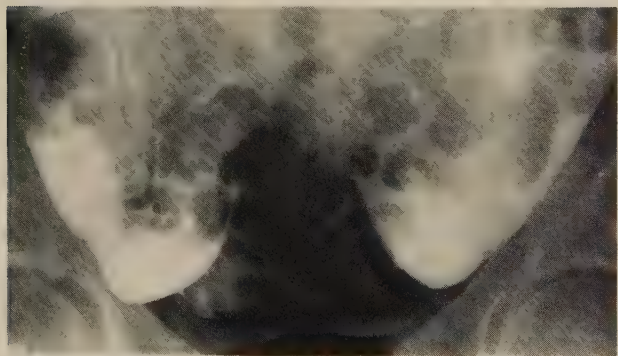


Fig. 45 a

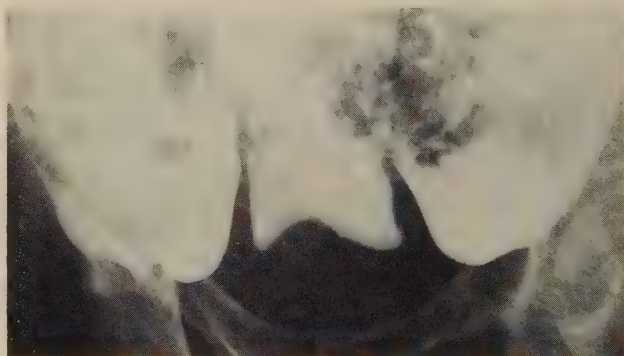


Fig. 45 b



Fig. 45 c

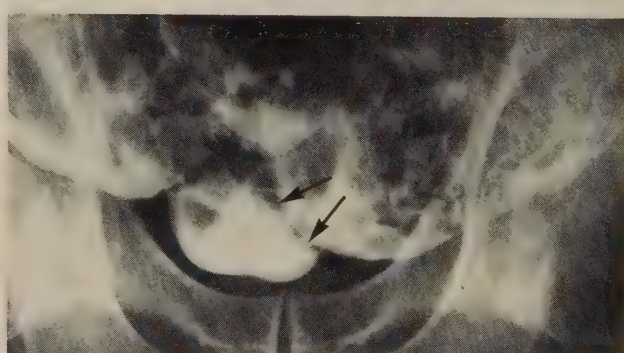
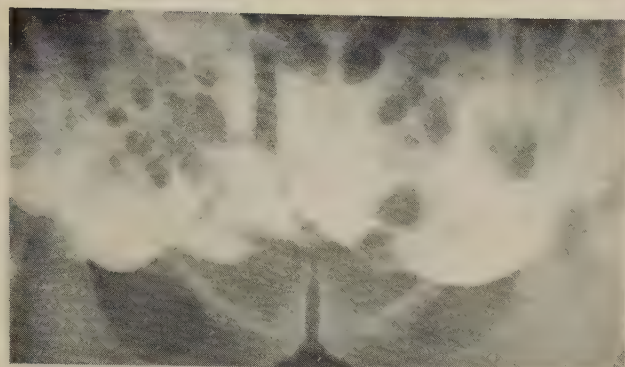
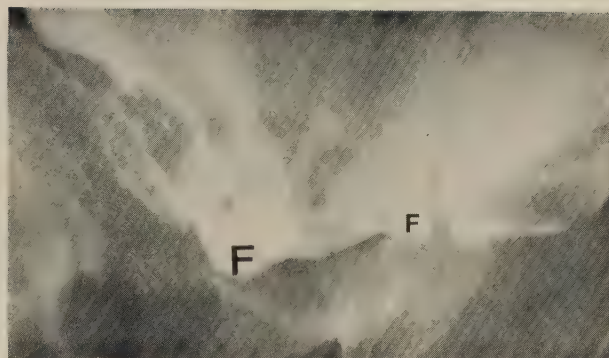


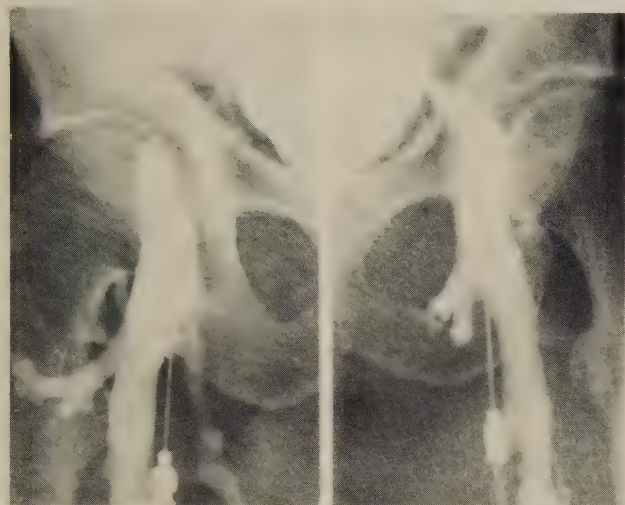
Fig. 45 d



a



b



c

Fig. 46. Broad fossae and inguino-femoral incompetence. Man 74 years. Pain in right groin and testis. a) Broad, deep fossae bilaterally. On left side displaced over midline. b) On oblique projection, inguino-femoral bulgings against femoral canals (F). c) Corresponding compression effect on veins.

sheath, which is also a derivate of the transversalis fascia. Of the 251 patients with broad fossa on the right side 53 (21.1%) had total compression of the femoral vein on the same side, 53 of 268 (20.9%) on the left side. Furthermore, many cases with a high degree of compression on the same side as a broad fossa (Fig. 46, left side) were found; on the right side 121 (48.2%) and on the left 131 (48.9%).

This syndrome was most frequent in patients with heavy work and also in young sportsmen (Table 11). It may be caused by repeated overdistention of the inner transversalis layer.

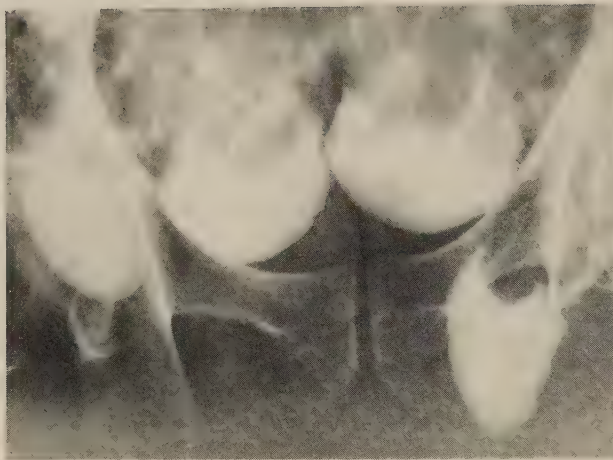
14. HERNIA IN YOUNG SPORTSMEN AND ATHLETES

The present series includes a group of 50 active sportsmen who, on training and competition experienced severe pain in one or both groins, prohibiting optimum activity. Thirty-four were younger than 40 years, of these only one female (Fig. 15 b). The most

common finding was a direct acquired hernia in the groin (Table 11). Only 3 were normal in the inguinal regions. The 2 patients illustrated in Fig. 48 were young boys with increasing pain after intensive football training.

The syndrome of broad fossa was a common finding in this group (Table 11). It was found in 14 cases on the right side (28.0%) and in 10 on the left (20.0%). This indicates an acquired weakness and incompetence in the transversalis layer from undue sports activity.

The compression phenomenon of the femoral vein indicating transversalis fascia incompetence, was amazingly common in these young sportsmen although otherwise uncommon in young people. On the right side total compression (Figs 44, 49) occurred in 9 cases (18%) and in additionally 18 cases (36%) a moderate compression was found (Figs 36 b, 50 d). The compression was often caused by a separate bulging of an inguino-femoral hernia behind a direct hernial sac (Fig. 49).



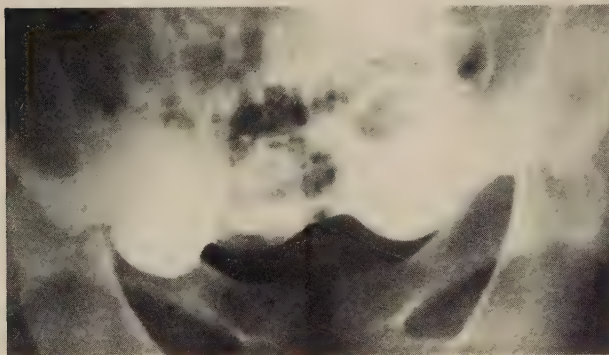
a

Fig. 47. Laxity of fossae in a man 80 years old. Reducible hernia in left groin. Many years previously operated upon for hernia in right groin. a) Large indirect hernia on left side. Broad-based



b

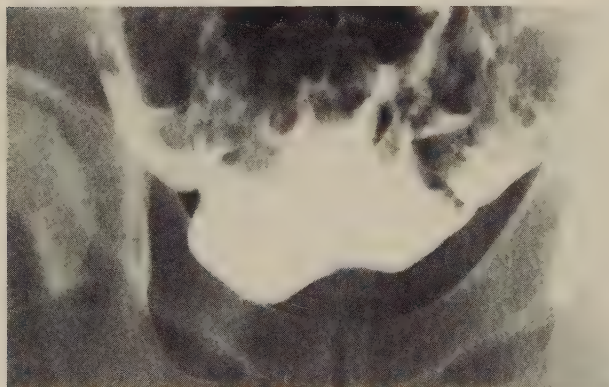
recurrent hernia of lateral indirect type on right side. Lateral umbilical folds displaced to midline bilaterally.



a



b



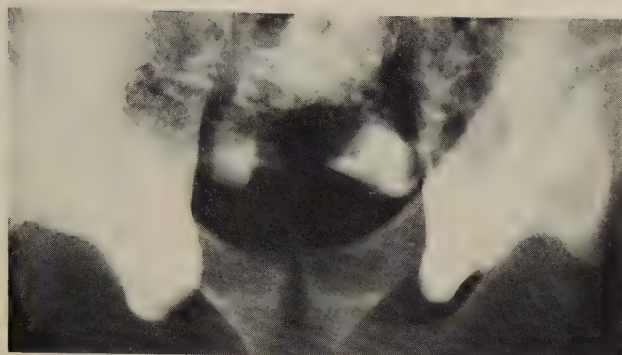
c

Fig. 48. Acquired hernias in sportsmen. a) Boy 17 years. After intensive football training, pain in right groin. Direct hernial sac on right side bulging elastically at fluoroscopy. b) Man 21 years. Same symptoms and same reasons as in case (a). Large direct hernia on right side, small one on left. c) Man 38 years. Competing walker with increasing pain in right groin. Broad hernial bulging from suprapubic fossa. Lateral umbilical fold displaced laterally. These 3 cases symptom-free after McVay operation on right side.

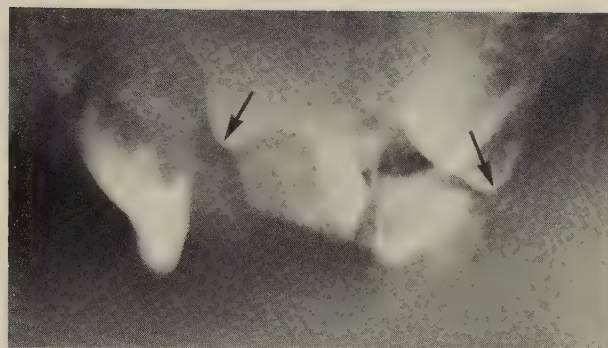
In these well trained sportsmen the flank in some cases on straining retracted medially more than normally with a flattening of the lateral fossa (Fig. 50b). Because of muscular hypertrophy the groins sloped more steeply in some cases. However, this seems not to prevent weakness and ruptures in the

transversalis layer in the groin. In several cases multiple hernias existed.

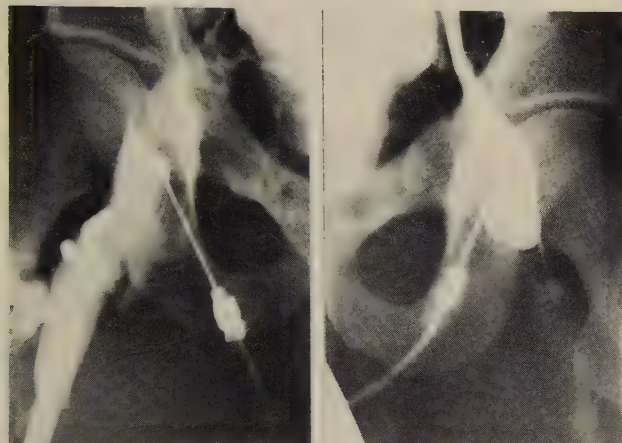
In 3 cases the pouch of Douglas was incompetent (enterocele) and one case had hernial diverticulas from this pouch (Fig. 50a). In additionally 4 cases the pouch of Douglas was broad and on straining,



a



b



c

Fig. 49. Hernias in active football player. Man 28 years. Pain and heaviness in both groins. No hernia palpable but impulse felt bilaterally. a) Large ruptures of medial inguinal fossae bilaterally. b) Oblique projection III. Inguino-femoral bulgings behind direct hernias (→). c) Compression of femoral vein, most marked on right side on which slight incompetence in medial circumflex vein exists. Findings confirmed on right side at McVay operation.

was lowered to the level of the pelvic outlet (Fig. 51).

15. SLIDING HERNIA IN THE GROIN

Sliding hernia in the inguinal regions is much debated in the surgical literature (HOTCHKISS 1909, MOSCHCOWITZ 1925, WILLIAMS 1947, MORETZ 1964, PONKA 1966, MACKIE & BERKOWITZ 1978). By definition (NYHUS & BOMBECK 1972) a sliding hernia is present when a portion of the wall of the hernial sac is composed of a part of an organ such as the cecum or the sigmoid colon. The serosa covering the

sliding organ is continuous with the peritoneum of the accompanying sac and is surgically inseparable from the intestinal loop which is therefore a real part of the sac. If a viscus is simply adherent to the hernial sac by adhesions it should not be called sliding hernia.

It was stated by NYHUS (1964) that hernias with the bladder in the wall of the sac could also be considered as sliding but in surgical practice only those hernias are labelled as sliding which on the left side contain the sigmoid colon and on the right side the cecum. They are rare in females, and in contrast to the usual inguinal hernias they are four times more common on the left side than on the right (RYAN 1956).

In some analogy with hiatus hernia they can be divided into three types: intrasaccular, extra-saccular and parasaccular. The last group is the type in which the sliding intestine actually forms a part of the sac wall from which it cannot be separated without being damaged. This parasaccular type was found in 95 per cent of cases considered as sliding (RYAN 1956). In fact only this type of sliding hernia

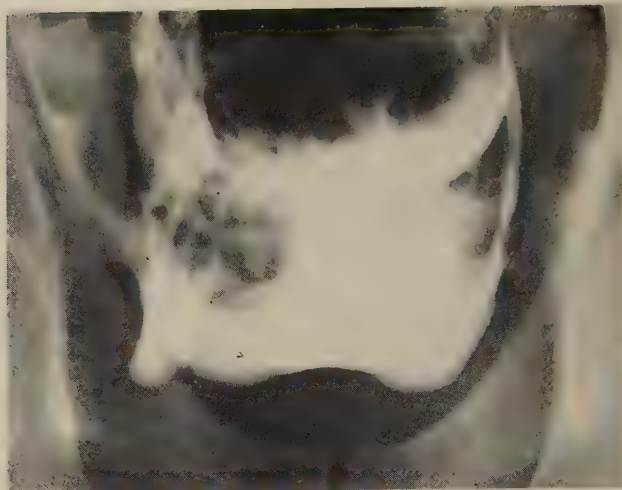
Table 12

Number of sliding hernia (manifest and incipient) diagnosed at herniography

	Right	Left
Sliding hernia, palpable and reducible	7 (2 F)	13 (2 F)
Recurrent	2 (M)	6 (M)
Confirmed at operation	3 (M)	9 (M)
Incipient	9 (2 M)	13 (4 M)



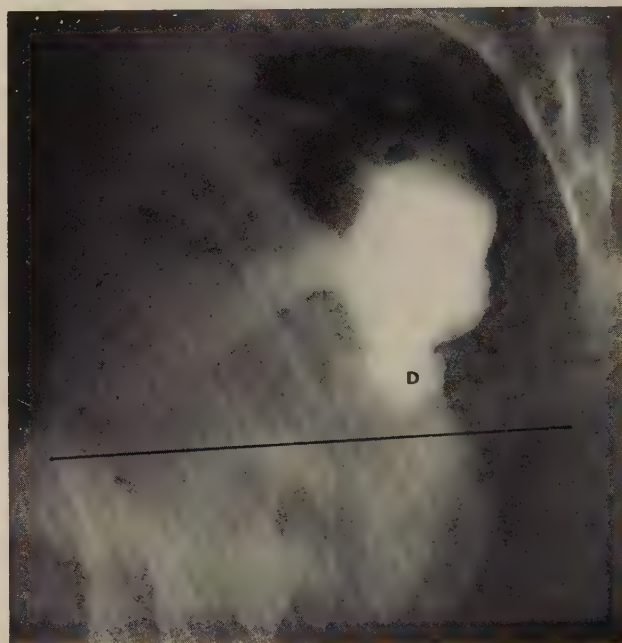
a



b



c



d

Fig. 50. Douglas diverticula (perineal hernias) and inguinal incompetence in a sportsman 23 years old (football) with muscular body build. Pain in right groin. a) During injection filling of diverticula from recesses of pouch of Douglas on both sides. Small posterior perineal hernias. b) In prone position these diverticula were drained from contrast medium. On right side almost complete femoral hernia. On straining, flanks above groins re-

tracted medially and lateral fossa therefore absent, a condition sometimes observed in muscular men. c) Phlebographic test, again filling of Douglas diverticula (supine) and of the femoral hernia. d) Standing lateral projection. Douglas diverticula (D) below bottom of pouch. Confirmed at operation on right side. No symptoms from pelvic floor.

is possible to diagnose at herniography. Sliding hernia cannot with certainty be diagnosed before operation without herniography.

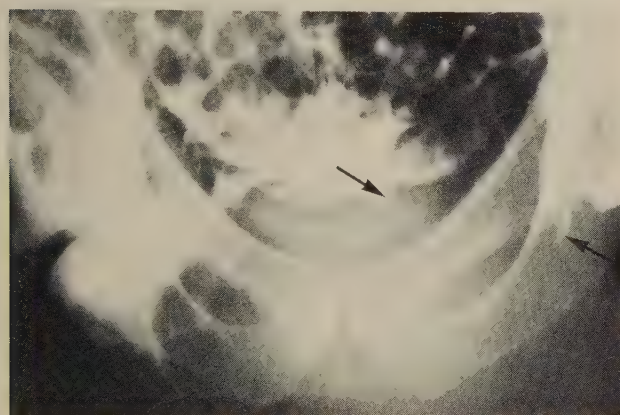
In principle the sliding type of inguinal hernia is almost always of the indirect type, through the deep inguinal ring (WILLIAMS 1947, PONKA 1966, NYHUS & BOMBECK 1972). Strangulation is rare because in the conditions present the deep ring is very large and distended. However, such hernia have a bad reputa-

tion of a high incidence of recurrence if the sliding intestinal loop is not properly handled and replaced into the peritoneal cavity.

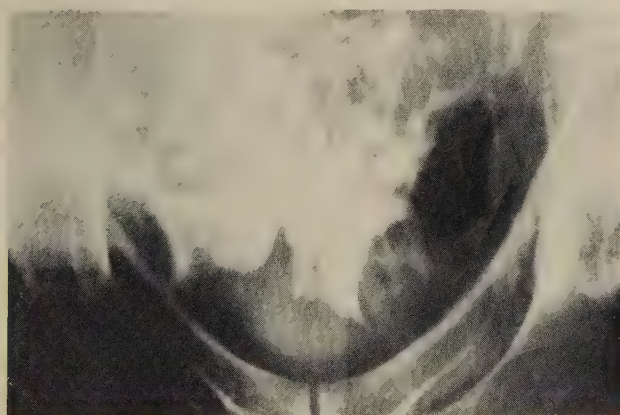
It was somewhat of a surprise when early in the present series a large reducible hernia was found to have no peritoneal sac possible to fill (Fig. 52). The number of additional cases appears in Table 12. They were twice as common on the left side and about half of them were recurrent hernias.



Fig. 51. Deep, broadened pouch of Douglas in a man 29 years. International football champion. Bilateral direct hernias.



a



b

Fig. 52. Sliding hernia. Man 56 years. Recurrent large hernia on left side, large reducible hernia on right. a) In prone position no filling of sac on left side despite repeated reductions. Broad, direct hernia easily filled on right side. b) After compression pad under right hernia still no filling of sac on left side in spite of large hernia. Contours of sliding sigmoid evident. At outlet site of extraperitoneal sliding viscus beak-shaped corners, between arrows in (a).

All of these cases were of the sac-less type with the sliding loop protruding below the peritoneum, which was lifted upwards in a typical manner (Figs 53, 54). The possibility of an adherent intestinal loop must be considered in these cases.

The cases in Table 12 labelled as incipient sliding hernia were patients with pain in the groin, often persistent after a previous operation. The herniographic findings were the same in the cases with incipient as with manifest sliding hernia, the contour of the fossae being interrupted and lifted upwards (Fig. 55). The posterior part of the sliding viscus is obviously adherent and its anterior part slides down under the peritoneal fossae. On either side of the sliding viscus typical beak-shaped tips appear (Fig. 55). In the group of incipient sliding hernia females dominated. This may be because the deep ring and the inguinal canal are more distensible in men than in women and a complete sliding is thereby rendered more difficult in women.

Some reservation should here be made for a rare type of hernia called interparietal hernia (ALTMAN 1978) or interstitial hernia (THOREK 1979), also emerging into the deep inguinal ring and thus a type of indirect hernia. The sac is located between the layers of the abdominal wall and has a direction parallel to the inguinal contour. They are most often located in front of the peritoneum as a kind of duplication. The case illustrated in Fig. 55 c is possibly of that type but is combined with an adherent sigmoid as in a sliding hernia.

Cases with the bladder adherent to the medial wall of a direct hernia were often found at operation. A finding indicating this condition is an increased lateral curving of a direct hernial sac (Fig. 56). It has to be confirmed by contrast filling of the bladder which is easily obtained after phlebography (Fig. 56).

A similar confirmation of a present sliding hernia can be obtained with a barium enema (Fig. 53 b-d). However, this is best made on a later occasion, the herniographic medium is otherwise disturbing. The sliding part of the viscus protrudes below the lateral inguinal fossa, best seen on an oblique projection (Fig. 53 d). The sliding part of the sigmoid glides along the posterior adherent descendent colon, partly retroperitoneally located. This is a prerequisite for the occurrence of a herniation of a bowel loop without a peritoneal sac.

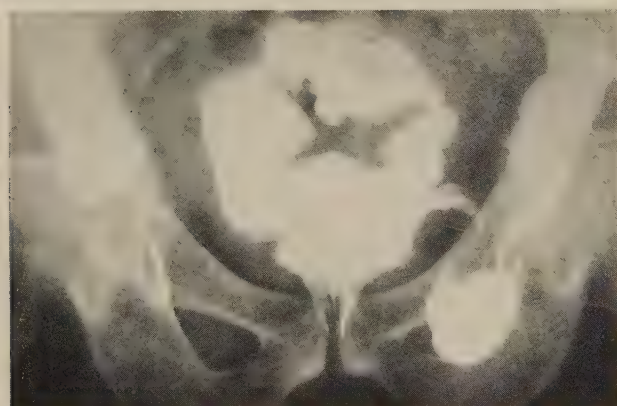
Incarcerated or strangulated hernias are no indication for herniography as they must be operated upon



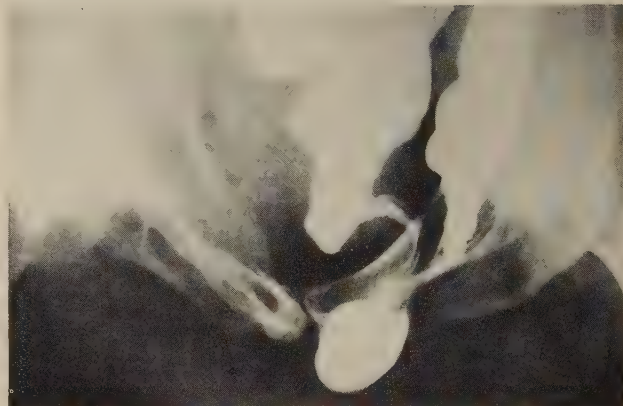
a



b



c



d

Fig. 53. Recurrent sliding hernias. a) Man 32 years. Operated upon one year previously on left side. Thin-walled direct hernia found, sac reduced only and Bassini operation performed. Soon recurrence. In spite of large reducible hernia, no sac filled. Outline of sliding sigmoid colon (→). Lateral umbilical fold displaced forward and supravescical fossa somewhat lifted. b-d) Man 76 years. Last year recurrent hernia in left groin. Reducible. No sac

could be filled. Palpable hernia corresponds to filling defect in lateral fossa (→ in b). c) Barium enema confirms sliding type of hernia. d) Oblique projection. Sliding part rolling down on straining over posteriorly adherent (retroperitoneal) descending colon. At operation sigmoid protruding without sac through inguinal canal.

without delay. Furthermore, filling of the sac would be prevented by obstruction in the hernial neck and a similar appearance as in sliding hernia may occur. One case of femoral hernia in the present series was incarcerated and non-reducible during the examination. A beak-shaped tip pointing to the femoral canal suggested the correct diagnosis and the patient was immediately operated upon.

16. OBTURATOR AND SCIATIC HERNIA

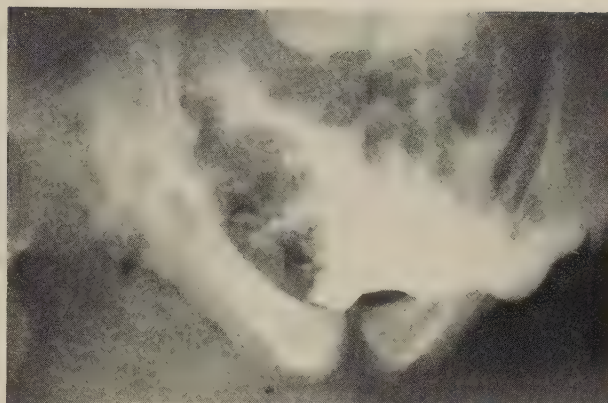
Oburator hernia is clinically suggested by the sign of Howship-Romberg (ROGERS 1960, 1964, GRAY & SKANDALAKIS 1978). Pressure of the sac on the obturator nerve in the narrow bony and ligamentous canal, causes pain and paresthesia anteromedially in the thigh. ROGERS (1964) was amazed at the small,

sometimes slit-like opening through which herniation can occur. SINGER et coll. (1955) reported a common finding of prehernial fatty protrusions into the rigid canal. Large anatomic series dissected with special attention to the obturator canal were reported by ANSON et coll. (1950), ANSON (1964) and ANSON & MCVAY (1971).

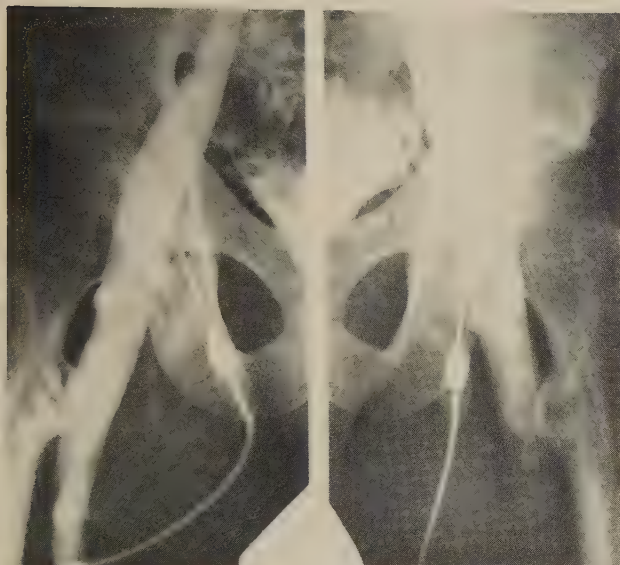
Sciatic hernias are said to be the rarest of all hernias (BLACK 1978). They emerge through the greater sciatic foramen. They are classified as suprapiriformis or infrapiriformis, depending on their emergence either superior or inferior to the piriformis muscle (BLACK 1978). They are also called gluteal hernias because of their emergence in connection with the superior or inferior gluteal vessels (ANSON & MCVAY 1971). A third type of sciatic hernia, called subspinous hernia, through the lesser



a



b



c

Fig. 54. Large sliding hernia of cecum. Man 18 years. Operated upon in right groin in childhood. Last year, often pain in right flank and sense of fullness in groin. In herniographic position, on straining: reducible hernia size of hen's egg. On reduction bubbling feeling of viscus. a) Typical appearance of cecal sliding hernia with cecum partly extraperitoneal, sliding down through widened deep ring. b) Slight oblique projection: gas-filled viscus outside pelvic border. Beak-shaped peritoneal margin at outlet place. No sac could be filled. c) Phlebographic test: vein intact, in accordance with hernia of pure inguinal type. At operation, cecum found directly in widened deep ring.

sciatic foramen (BLACK 1978), is said to be extremely rare. The infrapiriformis type emerges along the sciatic nerve. Only 2 cases with sciatic nerve symptoms from a confirmed sciatic hernia have been reported (BLACK 1978).

Table 13

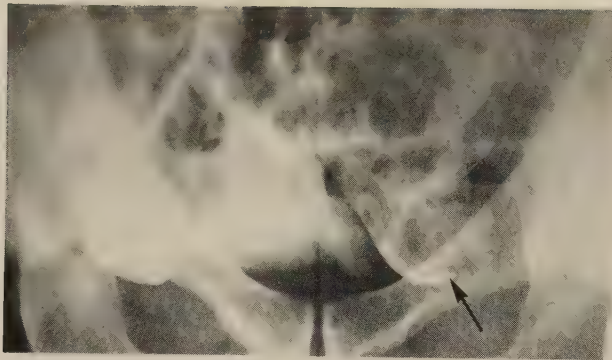
Number of obturator hernia and sciatic hernia found in the herniography series (914 cases) and hysterosalpingography series (500 cases)

	Right	Left
Obturator hernia		
Herniography	16 (9 F)	11 (7 F)
HSG	3	3
Sciatic hernia		
Herniography	1 (F)	2 (1 F)
HSG	0	2

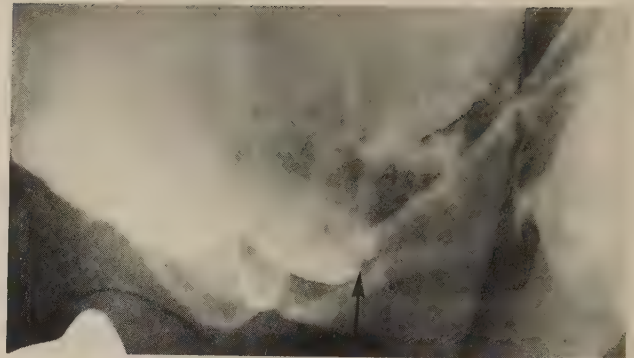
A clinical suggestion of sciatic hernia may be raised in cases with swelling in the gluteal region. Intestinal obstruction may occur but its connection with the hernia is difficult to evaluate. These internal hernias through the pelvic wall have not previously been diagnosed with direct contrast filling.

A herniographic criterion of an obturator hernia is the exact localization of the hernia in the obturator canal which in its lateral part is a bony excavation in the upper lateral corner of the obturator foramen (Figs 57, 58). This canal is without appreciable distensibility and most of these hernias had a long and narrow neck (Figs 58, 88). They were often filled already during the injection in the supine position (Table 13, Fig. 58 a).

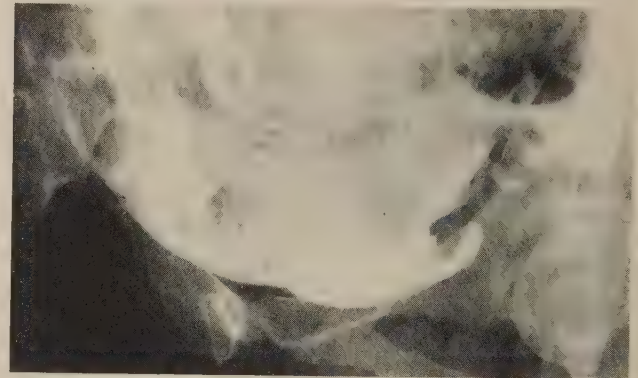
On question some patients reported occasional pain in the thigh. A clear sign of Howship-Romberg was found in only 4 of 24 patients in the hernio-



a

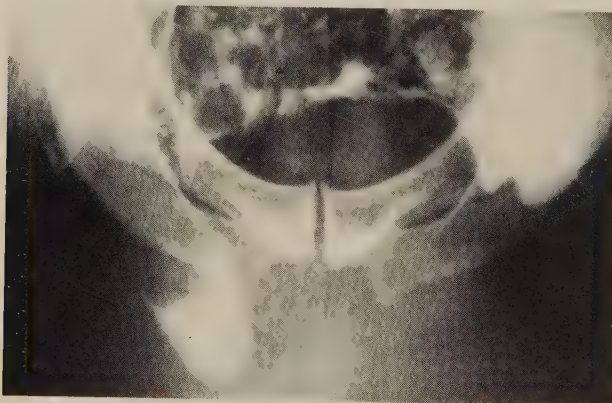


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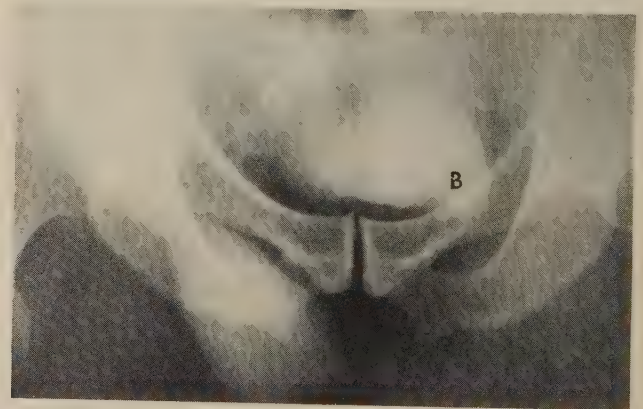


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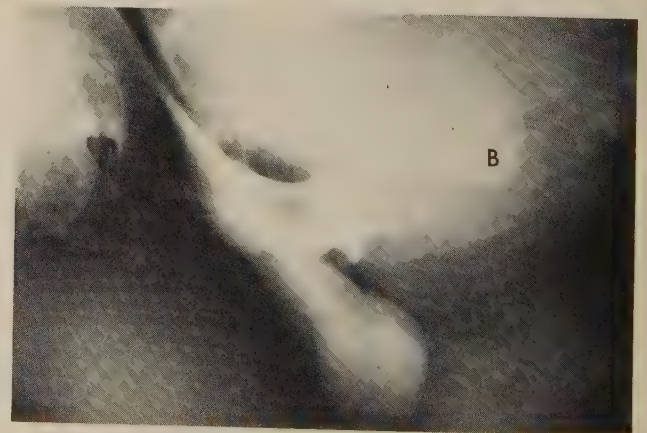
Fig. 55. a, b) Incipient sliding hernia of sigmoid colon. Man 44 years. For half a year, pain in left groin and testis. No hernia palpable, no impulse felt. Superficial inguinal ring very large. a) Sigmoid partly extraperitoneal as in sliding hernia. Peritoneal edges (→) clamping viscus. b) Oblique projection: outline of fossae not visible due to partly adherent sigmoid. On right side, broad-based direct hernia from suprapubic fossa. c) Woman 39 years. Pain in left groin. Clinically no abnormality. Oblique projection III. Adherent sigmoid lifting lateral fossa. Peritoneal pouching, below medial side of sigmoid similar as in sliding hernia but more even outline and hernia-like sac along abdominal wall indicating interparietal, preperitoneal sac. Laparoscopy: sigmoid adherent in left groin.



a



b



c

Fig. 56. Sliding hernia of bladder. Man 47 years. Large scrotal hernia. a) On right side, large indirect sac difficult to fill because of preceding viscus. Deep, direct pouching on left side with rounded lateral displacement suggesting bladder hernia. b, c) After phlebographic test filling of bladder (B): sliding hernia of parasaccular type. The large right sac better filled after reduction of viscus not possible at beginning of examination. Herniectomy on right side.



Fig. 18. Large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis.



Fig. 19. Anteroposterior view of the pelvis showing a large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis.

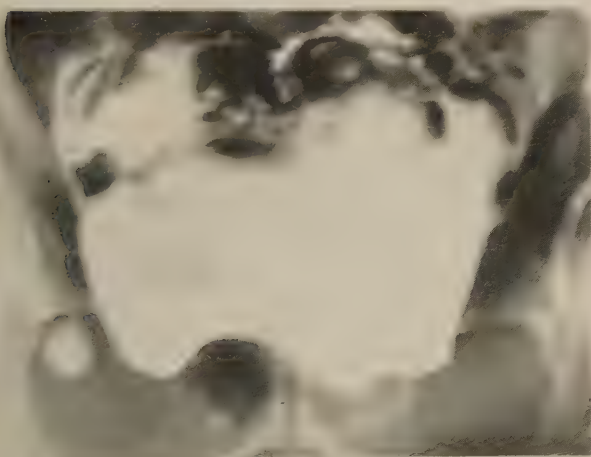


Fig. 20. Lateral view of the pelvis showing a large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis.

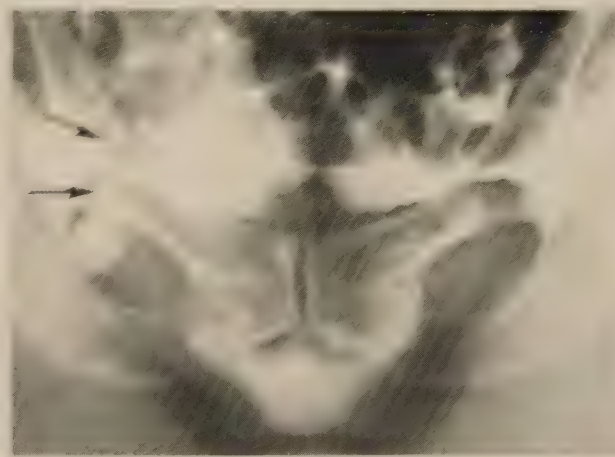
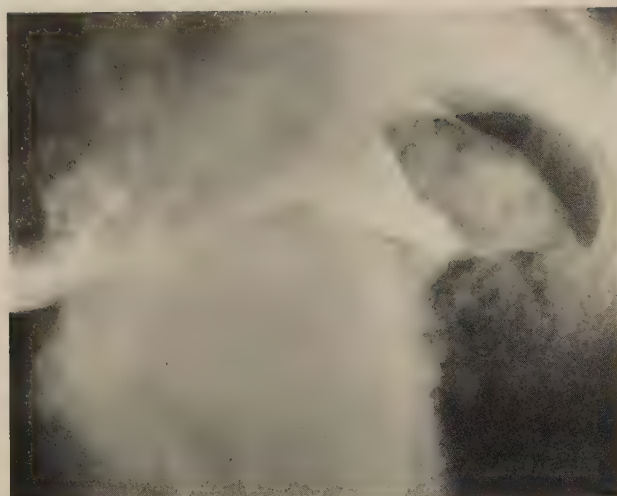


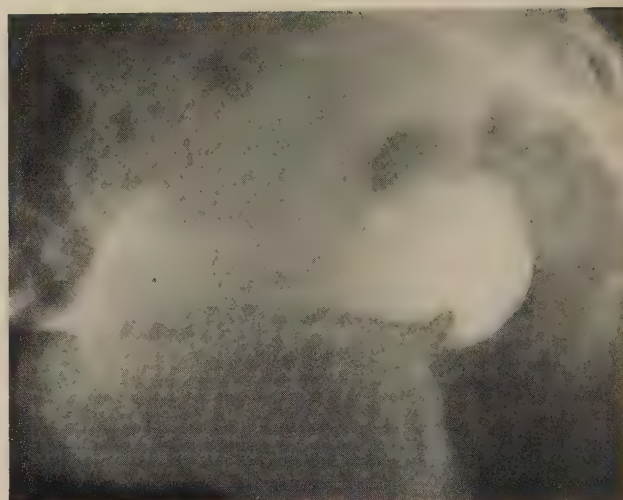
Fig. 21. Anteroposterior view of the pelvis showing a large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis.



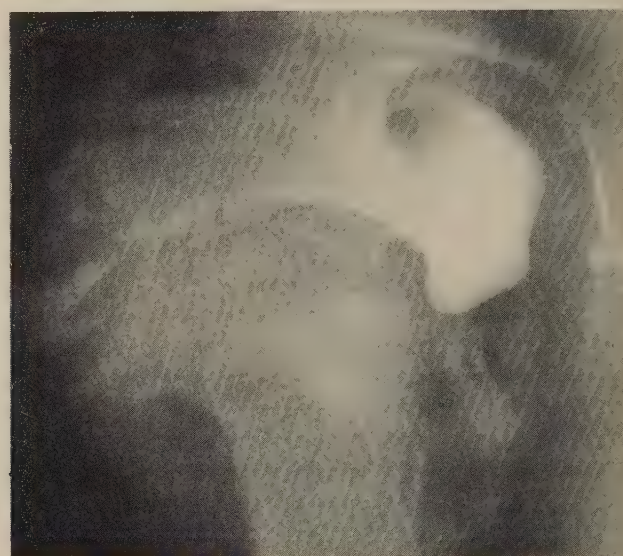
Fig. 22. Lateral view of the pelvis showing a large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis. Large space-occupying lesion of the right hemipelvis.



a



b



c

Fig. 60. Normal pouch of Douglas in males. a, b) Man 40 years. Normal appearance of the pouch (a) before and (b) after defecation. c) Man 60 years. In elderly patients the pouch is often broader and deeper.

graphy series. Eighteen patients were over 60 years of age and of a lean and slender type. The 2 cases presented in Fig. 57 were found in the HSG series; both had the typical sign of Howship-Romberg.

As in femoral hernia they are often filled in both the prone and supine positions (Fig. 58). They are situated in the same sagittal plane and could therefore be difficult to distinguish. The fixed relationship

Table 14

Frequency of enterocele (pathologic deep pouch of Douglas) and number of cases with defecation block in age groups of decades. Per cent in parentheses

		Age groups (years)							
		10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-
Enterocele, males	-		3 (3.3)	8 (5.8)	5 (4.7)	16 (12.0)	17 (16.3)	8 (19.5)	-
Defecation block	-		-	-	1	2	1	2	-
Enterocele, females	-		1 (3.2)	10 (19.2)	12 (21.4)	15 (26.8)	16 (35.6)	7 (50.0)	-
Defecation block	-		1	1	2	3	3	2	-



a

Fig. 61. Normal pouch of Douglas in females. a) Woman 24 years. Pelvigraphy following hysterosalpingography. Bottom of ovarian fossa (→). Uterus anteverted. b) Woman 35 years. Intrauterine



b

device in cavity of anteverted uterus. The shape of the pouch depends on individual sacro-coccygeal curving.



Fig. 62. Enterocele with rectum blockade. Woman 71 years. For many years, rectum blockade symptoms. Large enterocele (pathologic deep pouch of Douglas). No certain rectocele. Symptom-free after obliterating operation (Moschcowitz).

of the obturator hernia to its canal in various projections is decisive. Only 3 cases were operated upon directly for obturator hernia in the present series. Another 2 cases had an obturator hernia repair made in addition to a hernia operation in the inguinal region. In one patient the obturator hernia was confirmed at laparoscopy and in one at autopsy. The 5 cases of sciatic hernia were incidental findings. One of the HSG cases was of the infrapiriformis type, the others suprapiriformis (Fig. 59). These patients had no sciatic nerve symptoms and they are not confirmed by operation.

17. INCOMPETENCE OF THE POUCH OF DOUGLAS

This condition is also called enterocele or perineal hernia. In the fetus the pouch of Douglas is open down into the perineum (WALLDÉN 1953, KOONTZ 1964) and at birth is more or less obliterated, leaving a moderate pouching anterior to the rectum.

By definition a perineal hernia is a peritoneal protrusion through the endofascia and muscles that form the pelvic floor. Uterine prolapse or descensus, cystocele and rectocele are accompanied by some



a



b



c

Fig. 63. Rectum blockade in young females with marked enterocele. Pelvigraphy following hysterosalpingography. a) Woman 26 years. Intermittent blockade symptoms. Primary sterility. b, c) Woman 26 years. Severe blockade symptoms. In supine a.p. projection filling of very deep pouch (c).

degree of peritoneal pouching and can be considered as sliding hernias of these organs (GOLIGHER 1978). However, with these structures in normal position real perineal hernia may exist. Most common is a pathologic deep pouch of Douglas which according-

ly should be defined as a posterior perineal hernia, it is also called enterocele (FIGGE 1964). Anterior perineal hernias are said to occur only in women (KOONTZ 1951). They protrude forward into the labium majus (labial hernia) and are also called pu-

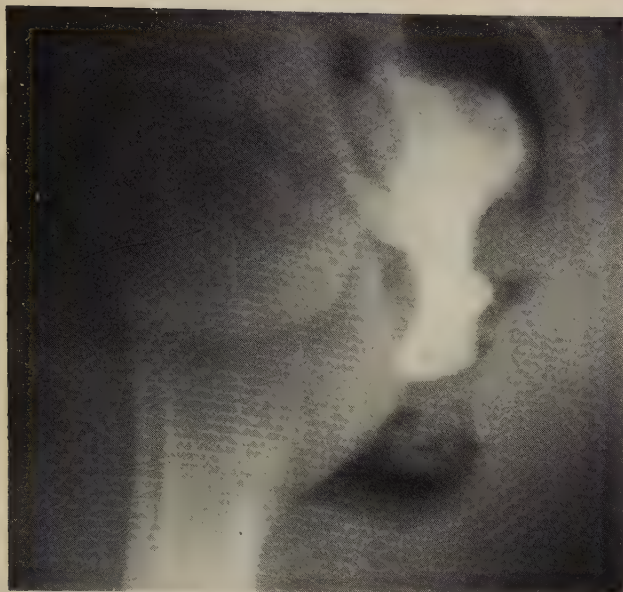


Fig. 64. Enterocoele with rectocoele. Woman 56 years. Blockade symptoms, clinically obvious rectocoele. Moderate enterocoele compressing rectum during straining. Descensus of rectum may be defined as sliding hernia of rectum.

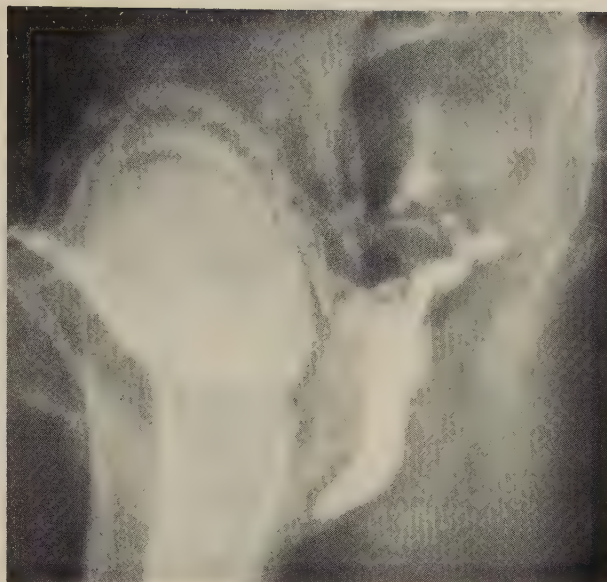
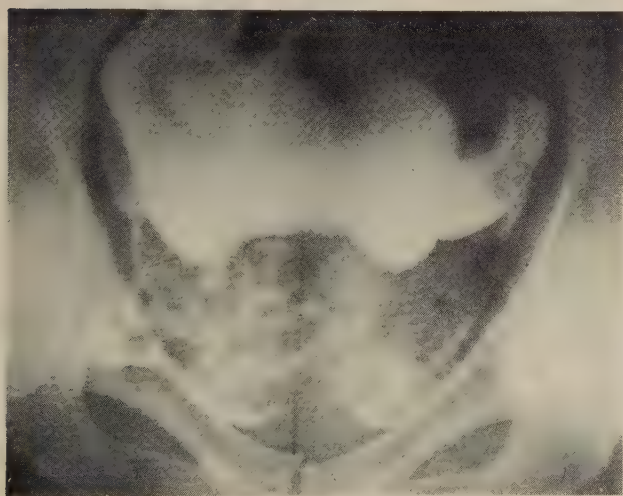
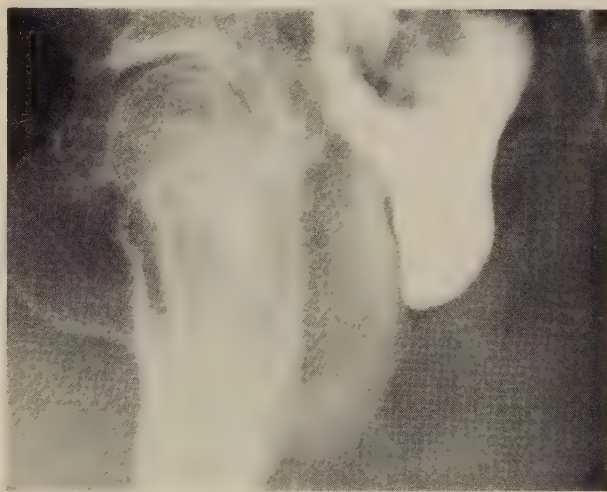


Fig. 65. Woman 77 years. Slight symptoms of uterine prolapse. Narrow and deep enterocoele and descensus of pelvic floor. No certain blockade symptoms.



a

Fig. 66. Enterocoele combined with retroflexion of uterus. Woman 33 years. No blockade symptoms. a) In horizontal prone position, p.a. projection, contrast medium trapped in deep pouch of Douglas.



b

las and ovarian fossae, therefore incomplete filling of inguinal fossae. b) Standing, lateral view, uterus dipping down into the pouch.

dental hernia. Most anteriorly and in the midline behind the symphysis is the outlet site for a very rare internal prevesical hernia which may occur in men (KEYNES 1964).

KJELLBERG (1942) showed cases with a contrast-filled pouch of Douglas and some cases of recess-like off-shoots into the perineum. On films made in prone position, in fact herniographic films, the later-

al umbilical fold is, however, erroneously considered as the round ligament (KJELLBERG, Figs 117, 169). Defecation block in cases with pathologic deep rectogenital pouch (pouch of Douglas) was investigated by WALLDÉN (1952) and EKENGREN & SNELLMAN (1953) and was examined by BRODÉN & SNELLMAN (1968) and AHLBÄCK & BRODÉN (1978) using cineradiography. JORULF (1975) reported on



a

Fig. 67. Rectum blockade after extirpation of uterus. a) Woman 35 years. Moderate enterocele compressing rectum. b) Woman



b

54 years. Large enterocele occupying a large part of pelvic floor, tendency to labial hernia.

the accumulation of intraperitoneal fluid into the pouch of Douglas and in 6 cases also injected contrast medium, meglumine amidotrizoate (Angiografin, Schering), for demonstration of the pararectal fossae of the pouch of Douglas. Apart from the attempts by KJELLBERG abnormalities of the pouch of Douglas have only been demonstrated indirectly after contrast filling of the rectum and the small intestine. No systematic investigation using direct demonstration by peritoneography or herniography has been reported to date.

Throughout the present series the herniography was terminated with a lateral projection of the patient standing and after repeated strainings. Pathologic deep pouch of Douglas often superimposed the massive hip bones and the technical quality of the films may therefore sometimes not be as good as desired (Figs 67 b, 68 c).

In normal cases (Figs 4 b, 60, 61) the bottom of the pouch of Douglas is well above the line of the pelvic outlet (WALLDÉN 1953) which is drawn from the tip of the coccyx to the lower margin of the symphysis (Fig. 61).

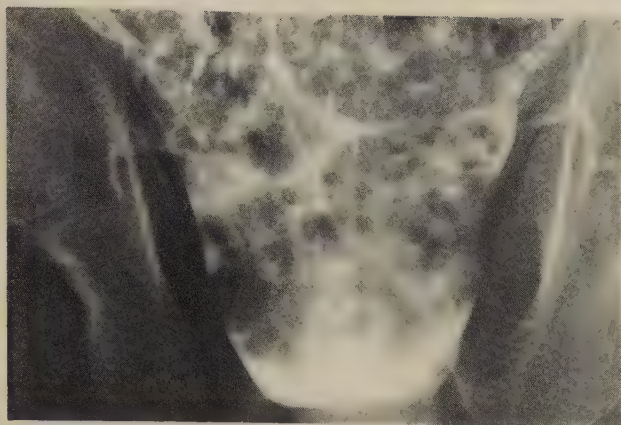
A pathologic deep pouch of Douglas, descending below this line, was found in 118 cases (12.9%). In Table 14 these are labelled as enterocele. Additionally, 72 cases (7.9%) had a broad and deep pouch reaching down to the level of the pelvic outlet (Fig. 51). Most cases occurred in the higher age groups

(Table 14). Cases with severe mechanical defecation block were few (18 patients). Four of these were operated upon (Fig. 62) and in 3 of these obvious alleviation of the symptoms was obtained. Of the blockade cases 12 were female (19.7% of the women with enterocele). One young woman (Fig. 63) had never had a normal defecation and had to have an enema every day.

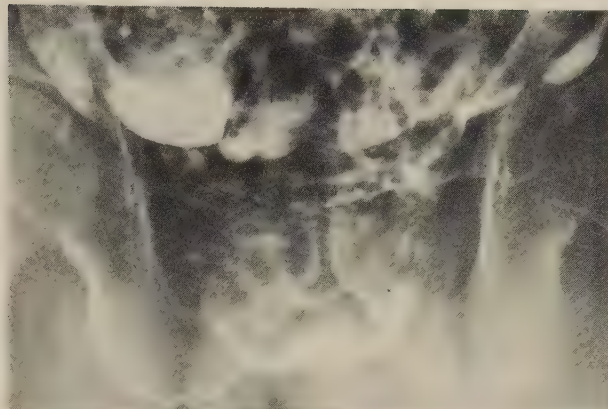
Of the 72 cases with moderate deep pouch only one case had symptoms of defecation block. One case with clinical proctoceles also had an accompanying enterocele (Fig. 64). Cases with uterine prolapse also had a deep pouching of the supravescical part of the pelvic floor anteriorly (Fig. 65).

Cases with retroflexion of the uterus were often found to have a deep pouch of Douglas with the fundus part of the uterus dipping down into the enterocele (Fig. 66). In these cases it was difficult to obtain satisfactory filling of the inguinal regions, the contrast medium being trapped in the pouch of Douglas behind the retroflexed uterus and in the ovarian fossae (Fig. 66 a). In such cases it was necessary to lower the head end of the table to make the contrast medium flow forward to the inguinal regions.

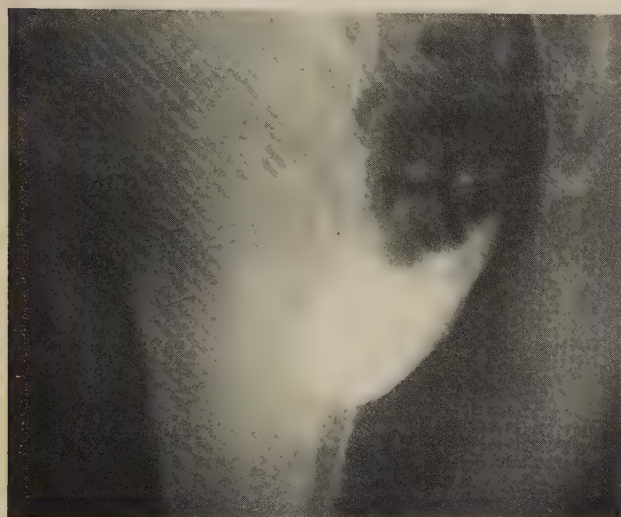
Two patients after removal of the uterus had increasing symptoms of rectum blockade (Fig. 67). The incompetent pelvic floor was of about the same appearance as in blockade cases in men (Fig. 68).



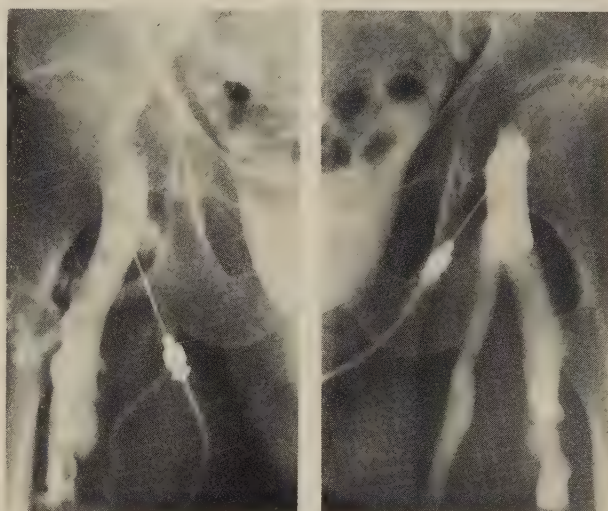
a



b



c



d

Fig. 68. Male 53 years with symptoms of rectum blockade. a) Supine position. On straining bowel loops descending into a deep enterocele. b) Prone position. Pouch of Douglas still filled. In groins, broad fossae. c) Standing, most of the contrast medium is

collected in the deep pouch. d) Phlebographic test. On left side, compression of vein most evident and incompetence of long saphenous vein. On right side, incompetence of medial circumflex femoral vein.

Often incompetence of the pouch of Douglas is only one of several other pathologic findings in the same patient. The case illustrated in Fig. 68 also had broad fossae, inguino-femoral hernia (left) and compression phenomenon of the femoral vein.

In many cases it appeared that the pouch of Douglas had a normal function in the pressing out of the content in the rectum during defecation (Fig. 60). In the case illustrated in Fig. 69 this function was absent because of previous operative obliteration of the pouch which seems to have been too extensive. No pouch at all was left and the patient still had some blockade symptoms.

One female with a large internal prevesical hernia is shown in Fig. 70. This patient had for several years had severe annoying symptoms behind the

symphysis and also micturition disturbances. A very deep sac was found hanging down below the lower margin of the symphysis.

Because the bladder is emptied just before the examination, a rather deep midline fossa behind the symphysis is often found in females (Fig. 61). In normal cases this fossa does not descend below the lower margin of the symphysis or the line of the pelvic outlet.

18. DIVERTICULA FROM THE POUCH OF DOUGLAS (PERINEAL HERNIA)

These diverticula are also called posterior perineal hernias. Three patients with diverticula from the pouch of Douglas were described by KJELLBERG

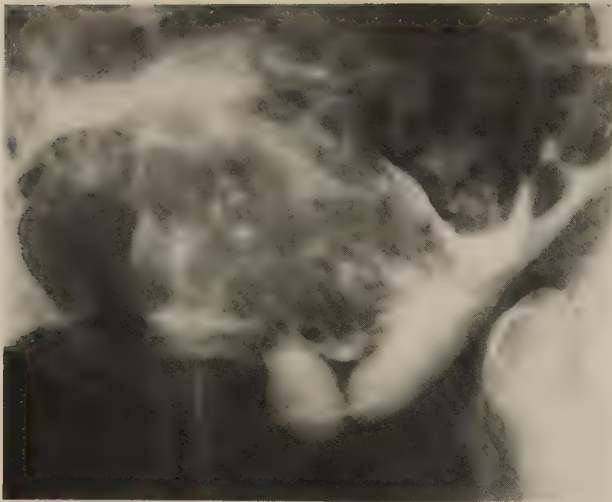


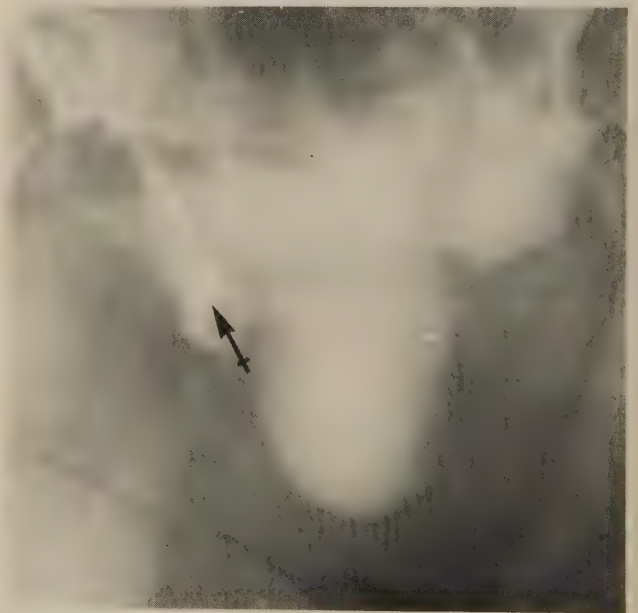
Fig. 69. Absence of pouch of Douglas after obliteration. Man 74 years. Bilateral Charnley prostheses. Four years ago operated upon (Moschowitz) for blockade symptoms. Slight defecation difficulties persisted. a) On injection no pouch filled. Instead



immediate filling of 2 inguinal hernial sacs in supine position. b) Standing. Only small residual contrast medium at site of obliteration (→). The medium mainly collected anteriorly over the symphysis.



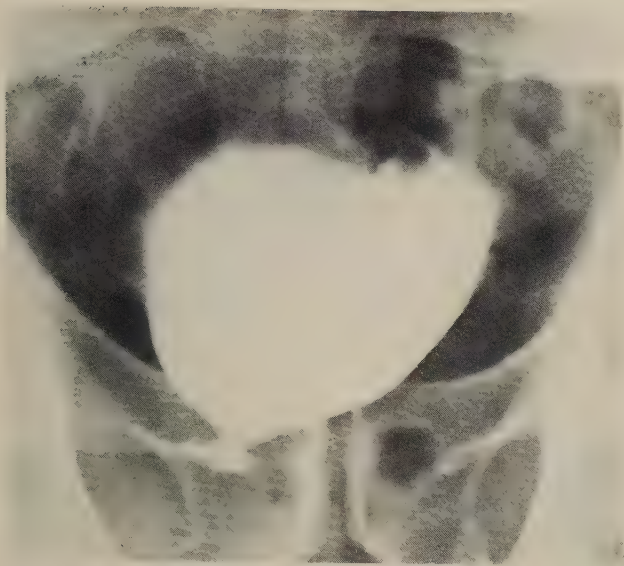
Fig. 70. Internal prevesical hernia. Woman 37 years. Pain behind symphysis after long standing, walking or hard work. Consulted medical service repeatedly without abnormal findings. On lateral standing view, scant filling of a sac behind and below the symphysis, projected over the trochanter massive. a) After several



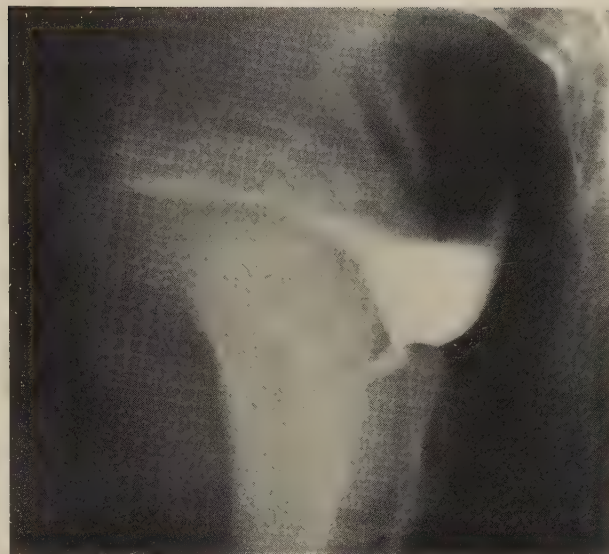
strainings in prone position filling of elastic sac below the symphysis. Bottom of pouch of Douglas (→) somewhat lowered. b) Oblique prone position (p.a. projection). Lower border of symphysis (→). At operation the deep elastic pouching behind the symphysis was obliterated. Symptoms completely alleviated.

(1942). This type of posterior perineal hernia was said by KOONTZ (1964) to be most common in females. In the present series Douglas diverticula were found in 24 (2.4%) patients (17 females, 7 males), in 2 cases bilaterally. In the HSG series of 500 young women such diverticula were found in 30 cases (6%).

Because of their posterior location they filled in the supine position during injection of the contrast medium (Figs 50, 71). They are actual perineal hernias through the pelvic floor and the sac has in most cases a narrow neck in passing the endofascia and the levator ani muscles. The hernia moves on straining and is stretched on downward movements of the



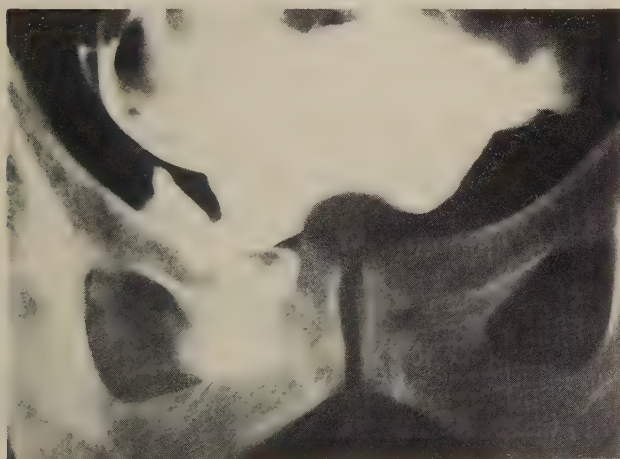
a



b

Fig. 71. Small diverticulum of pouch of Douglas. Man 71 years. Admitted for possible hernia in right groin. a) During injection, Douglas diverticulum filled on right side. b) Lateral projection,

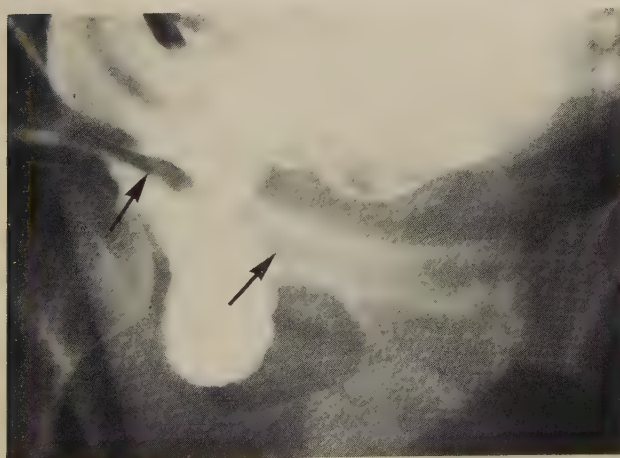
diverticulum emerging from anterior part of pouch, beginning posterior perineal hernia.



a



b



c

Fig. 72. Large posterior perineal hernia. Woman 46 years. Obscure symptoms from lower abdomen. a) Supine, beginning filling of Douglas diverticulum. b) After repeat strainings, filling of large sac. c) On oblique projection narrow neck. The sac follows the pouch of Douglas and extends below pelvic floor (→).

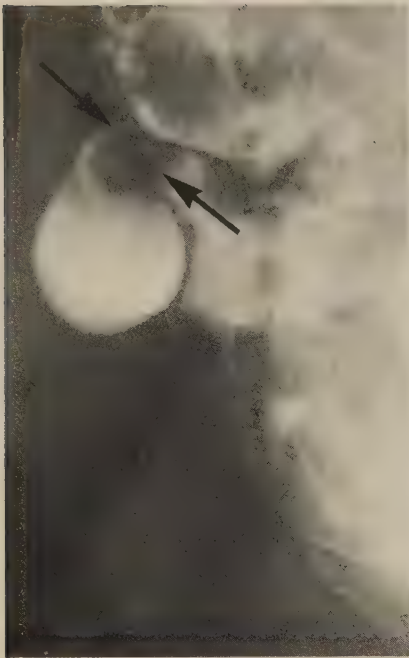


Fig. 73



Fig. 74 a

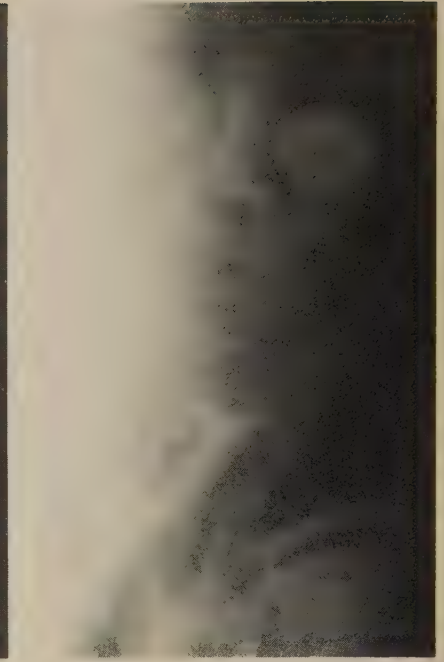
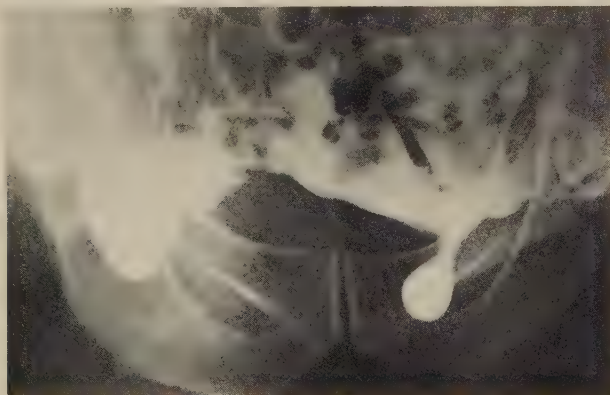


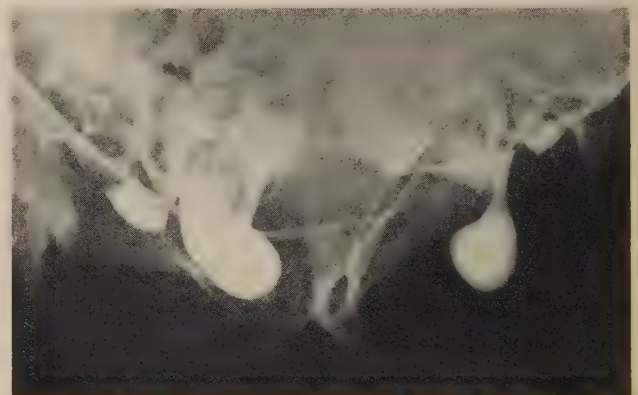
Fig. 74 b

Fig. 73. Spigelian hernia. Woman 68 years. Corpulent patient. Pain in right anterior flank. Horizontal supine oblique (45 degrees) position, a.p. projection. Sac with narrow neck (→) containing intestinal loop. Not certainly palpable. Confirmed at operation.

Fig. 74. Non-palpable Spigelian hernia. Man 79 years. Often pain in lower left abdominal wall. a) Tangential and b) p.a. projection. Small Spigelian hernia with omental fat protruding into sac.



a



b

Fig. 75. Recurrent direct hernia. Man 71 years. Many years ago operated upon in left groin. Small painful hernia on left, large bulging on right side without symptoms. a) Direct recurrent hernia with narrow neck emerging medial to umbilical fold and

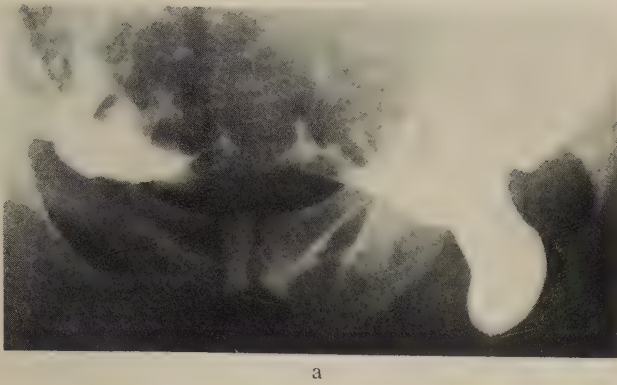
supravesical fossa stretched against opening. b) Oblique projection. Slit-like opening for narrow neck of sac curving anteriorly to inguinal ligament. In right groin, broad direct hernia of lateral type, also incipient indirect hernia in deep ring.

pelvic floor. They usually emerge from one of the lateral recesses of the pouch of Douglas which otherwise in most cases is of normal appearance. In only 6 of 24 cases some tendency to enterocele was found. Because of the narrow neck of the sac the filling often persisted also in the prone position. It could therefore erroneously be considered as a femoral hernia. With fluoroscopy and oblique pro-

jections a mistake can be avoided. These diverticula are also disclosed on lateral films. No certain symptoms could be attributed to these diverticula but a slight risk of incarceration may exist.

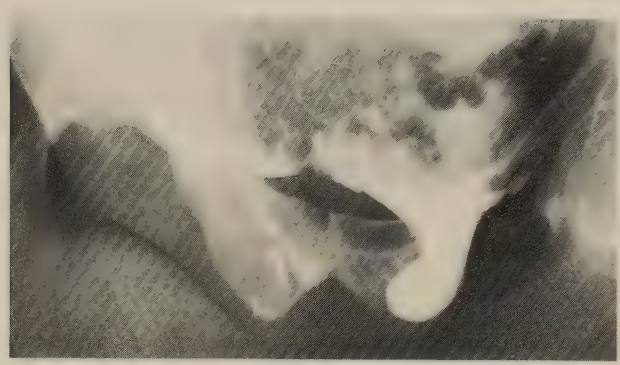
19. SPIGELIAN HERNIA

This type constitutes a spontaneous, lateral-ventral hernia emerging lateral to the border of the rec-



a

Fig. 76. Large recurrent direct hernia. Man 39 years. Six years ago operated upon in both groins. Last year, recurrent hernia on left side. a) Laterally situated recurrent sac. Indentation laterally due to inferior epigastric vessels indicating medial, direct hernia.



b

b) Less evident on oblique view. No lateral umbilical fold visible, probably removed at previous operation. New operation: rupture in lateral part of McVay hernioplasty.

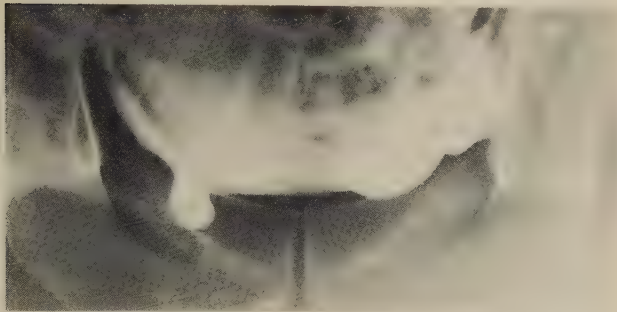


Fig. 77. Direct recurrency. Man 59 years. Operated upon 4 years previously with McVay hernioplasty. Now painful point in right groin. Nothing palpable. Umbilical fold absent on previously operated right side. At new operation, small rupture in middle of old repair.

tus abdominis muscle. It is named after a Flemish anatomist lecturing in Padua (1578–1625), Adrian van der Spieghel (latinized Spigelius). He gave the first description of the semilunar line which is the lateral border of the rectus muscle, or more exactly of the tendinous line just lateral to this muscle. About 3 to 4 cm below the level of the umbilicus this line meets a horizontal tendinous curved line, the semicircular line of Douglas. Below this line the rectus abdominis muscle lies behind the aponeurosis of the other abdominal muscles and is therefore described as the bare area of the rectus muscle. At the meeting point of these two lines a weak area exists which is the usual emerging place for the Spigelian hernia (Figs 1 b, 2 b). The Spigelian hernia protrudes lateral to the inferior epigastric vessels (READ 1960). A hernia, situated more caudally and which emerges medial to these vessels should be labelled direct inguinal hernia.

A Spigelian hernia is usually located relatively

high up in the abdominal wall where the external oblique abdominis muscle often is strong and uniform. Instead of penetrating the wall, the sac may spread out beneath it and in such cases the hernia should be termed interparietal or interstitial (HOLDER & SCHNEIDER 1974).

Spigelian hernias were occasionally diagnosed with the aid of contrast-filled intestines protruding into the sac (READ 1960). SPANGEN (1975, 1976) made peritoneography in 18 cases with later confirmed Spigelian hernia. In none of them a sac could be filled. In 19 of 24 patients, instead, the diagnosis was made with ultrasound.

On rare occasions they may be incarcerated (FRIED & MEEKER 1979). They must be differentiated from rectus sheath hematoma (JONES & MERENDINO 1962) a diagnosis best made with ultrasound (WYATT & SPITS 1979, FRIED & MEEKER 1979, MORLEY 1979).

Spigelian hernias were found in 9 cases in the present series: on the right side in 5 patients (4 men, 1 woman) and on the left in 4 (2 men, 2 women). However, 62 patients were referred with a suggestion of Spigelian hernia. Therefore only 14.5 per cent of this group were positive. Herniography should thus be restricted and, if possible, ultrasound examination used first. These hernias are best filled with the patient in horizontal prone position. The patient is then turned quickly to oblique position for tangential projection of the Spigelian line, halfway from the umbilicus to the flank (Figs 73, 74).

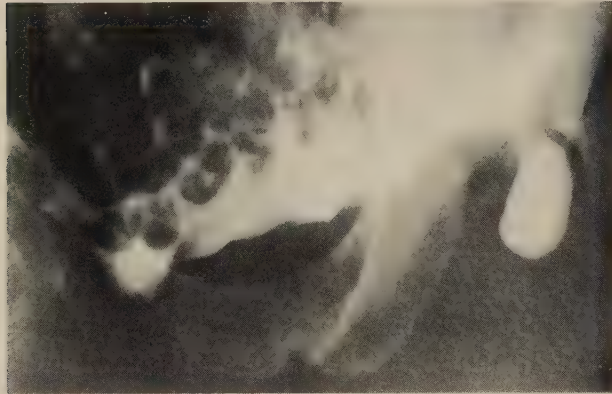
Very small hernias of this type could give intense pain and the site of the hernia could be pointed out distinctly by the patient (Fig. 74). It may be noted that of the 62 patients with suggested Spigelian her-



a



b



c

Fig. 78. Direct recurrence, incarceration risk. Man 55 years. One year previously operated upon on left side for direct hernia with Bassini hernioplasty. Soon recurrence with swelling and often severe pain laterally in groin combined with symptoms of bowel obstruction. a) Laterally situated recurrence through slit-like rupture, most evident on oblique projection (b). Forward direction of sac over inguinal ligament, best seen in projection II (c). At new operation direct rupture in scarred tissue of old repair. (On right side, incipient direct hernia of lateral type.)

nia in 19 cases (30.6%) some abnormality was found in the groins, in most cases incipient hernias. In 43 cases the inguinal regions were normal.

20. RECURRENT HERNIA

The question whether or not a recurrent hernia was present was an increasing indication for herniography. Totally 217 patients (23.7%) had been operated upon for hernia, bilaterally on 42 patients. On the right side 142 had been operated upon and on the left 117. In 74 cases a new hernia was palpable and the herniography was performed to demonstrate the type of hernia. The remaining cases had various symptoms. Recurrent hernias were found in 85 patients (59.9%) on the right side and in 76 (65.0%) on the left. In many cases complete or incipient hernia was found on the contralateral side, not previously operated upon. Normal findings were encountered in 35 cases only (16.1%).

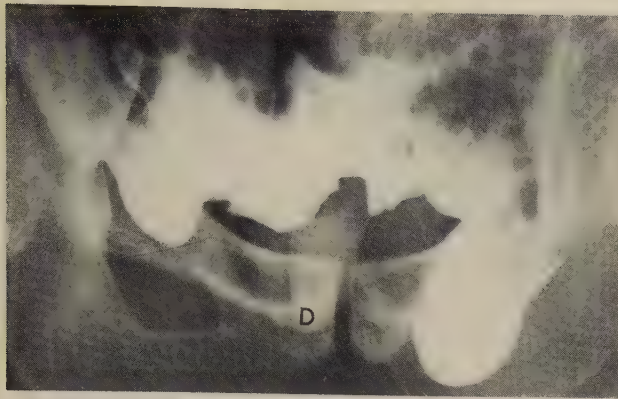
Most recurrent hernias were of a direct type. They were often diverticular with a narrow neck. They usually emerged either medially (Fig. 75) or laterally (Fig. 76) through the posterior wall of the inguinal canal. The rupture obviously occurs at either end of the repaired region.

Quite small diverticular pouchings of this type can also cause severe pain (Fig. 77). A laterally situated recurrent direct hernia may have the appearance of an indirect hernia (Fig. 78). The vertical, slit-like and narrow neck of the sac indicates the nature of a recurrent hernia. Such sacs fill easily as they are free of intestinal contents.

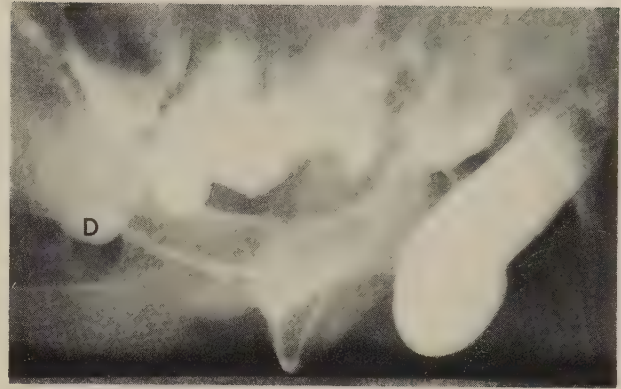
A recurrence of a true indirect hernia was rarely found, the case in Fig. 79 being unique. The patient was one year previously operated upon for a typical large indirect hernia with the sac within the spermatic cord. A Bassini hernioplasty was carried out. The new recurrent sac also emerged along the funiculus. The outline of the new sac was somewhat uneven, which may indicate its course through scarred tissue. In some cases a small indirect sac enlarged within a short time if not removed at operation for a direct hernia (Fig. 80).

21. ABNORMALITIES FOLLOWING HERNIOPLASTY

After hernioplasty with the new method using Cooper's ligament for strengthening and anchoring the posterior wall of the inguinal canal indentations



a



b



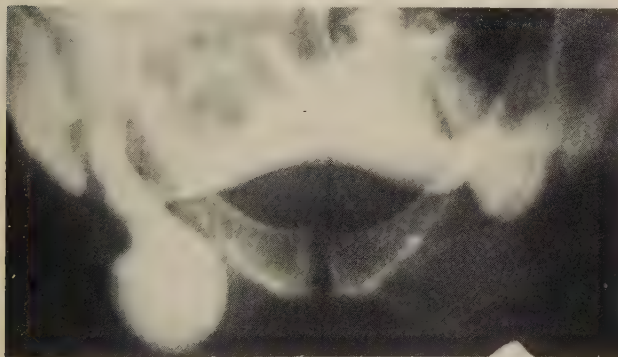
c



d

Fig. 79. Recurrent indirect hernia. Man 33 years. a, b) Large indirect hernia on left side and direct hernias bilaterally. Umbilical folds displaced medially. After removal of typical but rather broad indirect sac from spermatic cord, Bassini hernioplasty performed. Soon afterwards, pain and new swelling in groin. c, d)

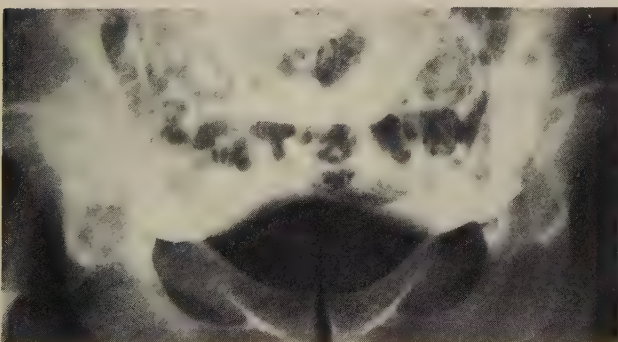
New examination one year later, recurrent sac of lateral indirect type with somewhat uneven outline indicating redissection in inguinal canal along spermatic cord. Direct hernias unaltered. Deep pouch of Douglas (D).



a

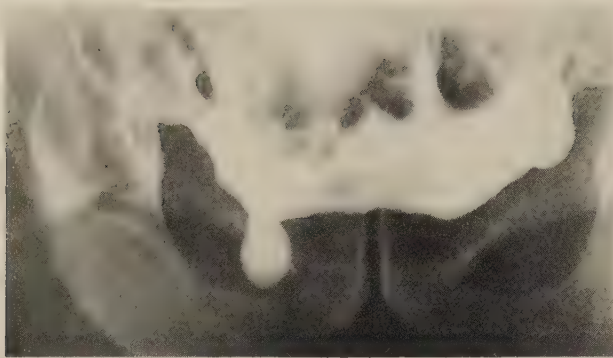


b



c

Fig. 80. Postoperative enlargement of hernial sac. Man 31 years. Nyhus operation for direct hernia on right side. Soon afterwards recurrence and attacks of incarceration. a) Herniography one year later. Direct recurrence (lateral type) with narrow neck of sac. Indirect sac laterally with direction into spermatic cord. On left side primary direct hernia, small indirect hernia in deep ring. McVay operation later made bilaterally. On right side cord seemed normal. Soon thereafter, new reducible hernia on right side. b) Repeat examination, 4 months after operation: enlargement of indirect sac within spermatic cord. Confirmed at third operation with extirpation of sac now distending spermatic cord. McVay operation performed. c) On third follow-up, one year later, no recurrence. Umbilical folds probably removed at re-operations.



a

Fig. 81. Postoperative deformity of fossa and direct recurrence. Man 76 years. Operated upon 3 years previously on right side for direct hernia (McVay). Pain and some swelling on same side for one year. Clinical findings doubtful. a) Small medial direct recurrent hernia, lateral to this, some deformity and lifting of fossa



b

with uneven outline as rest of Cooper's ligament hernioplasty. b) In oblique projection, deep recessus on right side of pouch of Douglas (D) not to be misinterpreted for inguinal pouching. Findings confirmed at operation.



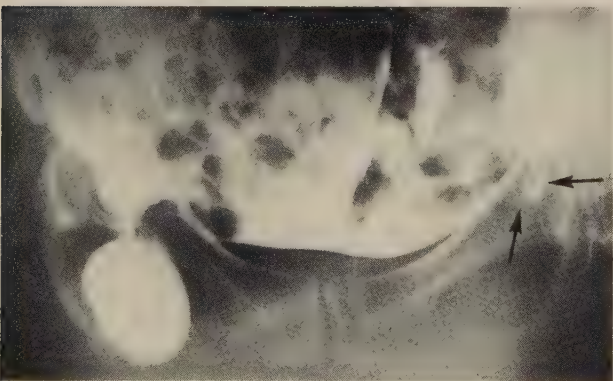
a

Fig. 82. Man 66 years. Operated upon 15 years previously on right side. a) Broad-based bilobulated direct recurrent hernia on right side. At new operation (Nyhush), entire posterior wall absent. Extensive hernioplasty using Cooper's ligament. b) Persistent



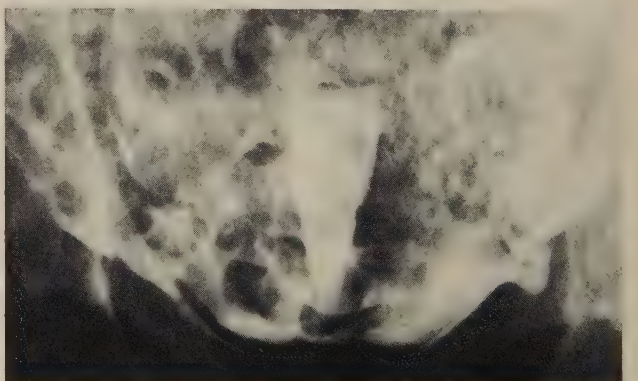
b

symptoms of distress on right side. Repeat herniography one year after (a). Entire inguinal fossa much lifted and stretched. Left side, broad direct hernia on both occasions, few symptoms. Presumably severe incompetence of posterior wall also on left side.



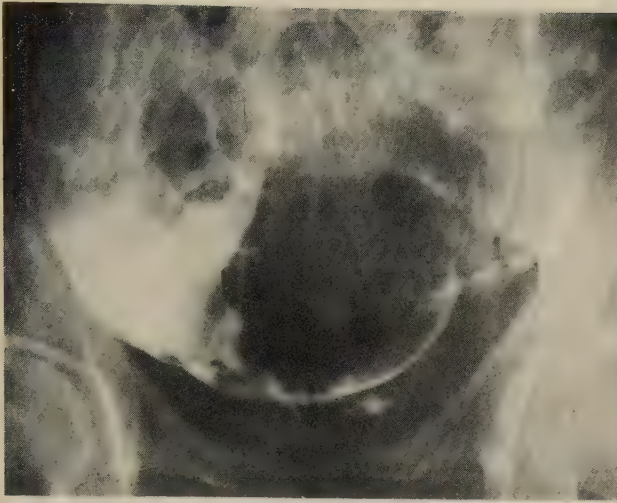
a

Fig. 83. Rectus diastasis and femoral hernia. Woman 69 years. Right side, below inguinal fold hardly reducible hernia, 2 cm x 3 cm. a) Typical femoral hernia on right side. Incipient femoral bulging on left side (→). Nyhus operation on right side. b) One



b

year later no recurrence. Femoral hernia on left side increased, rectus diastasis now seen which was not observed on first occasion. Femoral ring hernioplasty performed resulting in alignment of inguinal contour.



a

Fig. 84. Man 54 years. a) In connection with puncture for herniography, rectus hematoma developed on left side, pushing contrast medium over to right side of lower anterior abdomen in prone



b

position. b) Urography one month later: bladder displaced to right. No hernia.

of the lateral part of medial inguinal fossa often occur (Fig. 81).

In some cases where the hernioplasty for some reason had been extensive the entire inner inguinal contour was lifted upwards considerably (Fig. 82 b). This may cause persistent or even new symptoms of discomfort in the groin.

22. RECTUS DIASTASIS

This is a state of rupture of the linea alba in the midline of the abdomen known to occur in elderly patients (FORSSELL 1979). It is in most cases of no clinical importance. It is said to be most common above the umbilicus. In the present series it was found in 3 cases (Fig. 83), and below the umbilicus.

23. COMPLICATIONS FOLLOWING HERNIOGRAPHY

Only one case of severe complication following herniography seems to be reported (BUTSCH & KULM 1978). A boy, 3 years, had to be emergently operated upon; an intramural hematoma of the small bowel was found, obviously caused by the puncture. A non-viable part of the bowel was resected and the patient recovered.

In the present series a complication of clinical importance occurred in one case only; in this case a rectus hematoma developed. The puncture was made as usual to the left of the umbilicus and there

was nothing remarkable during the examination except that the contrast medium for some reason collected mainly on the right side (Fig. 84 a). Due to some distress to the left of the abdomen a urography was performed after a month, which showed the bladder displaced to the right. The abdominal wall was incised and the remnants of a large hematoma were found extending down into the lesser pelvis. The rectus hematoma was probably caused by inadvertent puncture of a preperitoneal vessel, presumably a ramification of the inferior epigastric artery. A spontaneous hematoma in the muscle caused by hard straining (WYATT & SPITZ 1979) may, however, not be ruled out. As no hernia was found many repeated strainings had been made.

A bowel loop was punctured in 3 cases early in the present series. After repeat puncture with a new needle the examination could be performed. No symptoms occurred after the examination.

In some cases the needle or catheter was trapped in the mesenteric fat and a small amount of contrast medium was injected into the tissue (Fig. 85). This was not felt by the patient, there being no sensory nerves in the mesentery. In two slender patients the catheter penetrated the posterior abdominal wall (Figs 86, 88). Immediate pain occurred at the back at the beginning of the injection, but soon disappeared.

Another observation was a reflux phenomenon from small pointed hernial sacs (Fig. 86). This occurred in 20 cases to some degree, all but one in males. Some of these felt a shooting pain after strain-

ing manoeuvres. It was found in small diverticular recurrent hernias and also in narrow-necked femoral hernias and in one case with a diverticulum from the pouch of Douglas.

24. OPERATIVE CONFIRMATION OF HERNIOGRAPHIC FINDINGS

Of the 914 herniography cases 316 were operated upon, i.e. more than one third. In these cases a detailed description of the operative findings was obtained and they were often discussed with the surgeon.

In 54 cases with indirect hernia a simple herniectomy was made, with removal of a sac with narrow neck and not much widened deep ring. They were mostly carried out on out-patients according to the report of the herniography. In one female with such a lateral hernia (with open and somewhat dilated processus vaginalis) the sac could not be found in spite of intensive search along the round ligament. On a repeat examination the sac was found to be resected shortly outside its emergence from the deep ring. This case could therefore not be considered false positive. Cases with real hernial sacs were at operation always found to have a sac corresponding to the herniographic finding. In fact, hernial sacs are more exactly discernible at herniography than during the surgical procedure.

In 4 cases with incipient direct hernia and weakness of the posterior wall at herniography the surgeon could not agree with that diagnosis. In two of these cases, nevertheless, McVay hernioplasty was carried out. They were thereafter free of symptoms. The other two cases may be considered as false positive.

Two cases with possible false negative findings were observed. A female, 32 years, epileptic, with pains in right groin had retroflexion of the uterus. Thus, only a poor filling of the inguinal fossae was obtained which with some uncertainty was reported normal. Operation 13 months later disclosed a direct hernia of diverticular type. Another female patient, 33 years, had persistent symptoms after two previous hernia operations in the right groin. The inguinal fossae were lifted upwards but no sac was filled. Five months later she was operated upon and a small sac was found below the femoral canal emerging through scarred tissue. These two cases may be labelled false negative, however, both due to unusual circumstances.

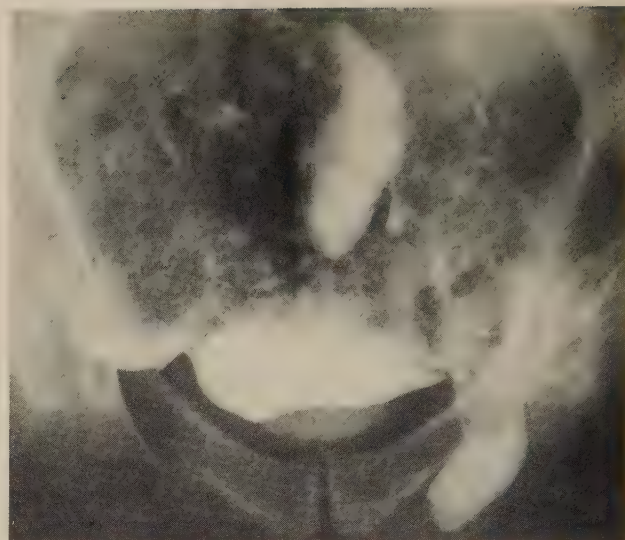


Fig. 85. Man 49 years. At start of injection, needle trapped in mesenteric fat with injection into mesenteric tissue. No symptoms, medium soon absorbed. Direct hernia, lateral type.

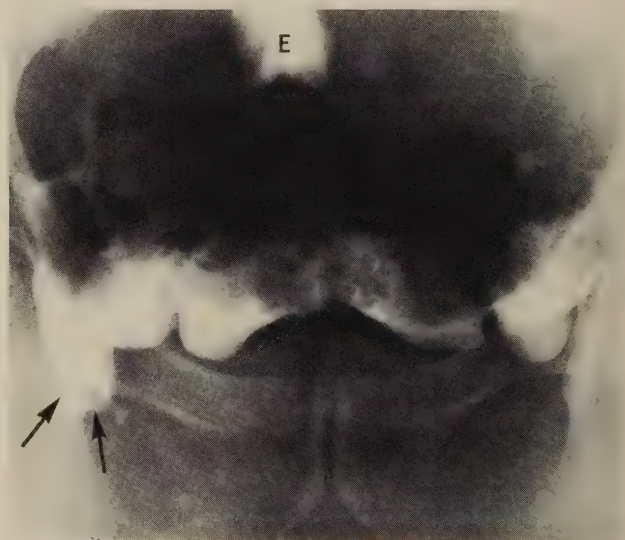


Fig. 86. Man 50 years. Patient with pain in both groins. At start of examination contrast medium injected into posterior abdominal wall (E) because of slender patient with very short distance through abdominal cavity. Immediate pain in back, which soon disappeared. Right side: broad-based indirect hernia with pointed ending into spermatic cord. Apex of sac ruptured on straining with contrast medium spreading outside sac (→). Immediate pain. Direct hernias of lateral type on both sides.

The Nyhus preperitoneal method was used in 21 cases (14 femoral hernia, 7 recurrent direct hernia). This method provides a good view of the hernial regions and in all these cases the correspondence with the herniographic findings was quite clear.

Lipoma in the femoral canal was confirmed in 11 cases, all on the right side. Only 2 of these were directly diagnosed at herniography (Figs 38, 39).

Table 15

Number of hernial abnormalities at herniography following hysterosalpingography in 500 young women examined for sterility. In 385 cases (77.0 per cent) normal findings in the groins. In some cases multiple changes

Hernial abnormalities in the groins	Right	Left	Bilateral
Indirect hernia, stage 1 and 2 (diverticulum of Nuck)	12	9	4
Indirect hernia, stage 3 and 4 (dilated, true hernial sacs)	10	5	—
Direct hernia, lateral type	8	4	1
Direct hernia, medial type	5	2	—
Broad and deep fossa	8	6	5
Complete femoral hernia	5	5	1
Incipient femoral hernia	14	12	3
Inguino-femoral hernia	31	28	11
Obturator hernia	3	3	—
Sciatic hernia	—	2	—
Total	89	70	
Pouch of Douglas			
Enterocoele	46		
Diverticula (small perineal hernia)	26		
Total	72		

In the other 9 cases the lipoma was suggested by a typical marked compression of the femoral vein. In addition many of the operated femoral hernias were surrounded by lipomatous fat. In these regularly a marked compression phenomenon occurred.

In the minor groups of special hernias the operative confirmation is reported in the respective chapter.

25. HERNIOGRAPHY AFTER HYSTEROSALPINGOGRAPHY

This series consisted of patients examined from September 1972 through January 1979. In sterility examinations with tubal passage an extra 20 ml was injected of the same contrast medium as used for herniography (Isopaque Amin, Amipaque or Conray Meglumin). The aim of this special series was twofold: First, an evaluation of the pelvigraphy for further gynecologic diagnosis, secondly to obtain information on the occurrence of hernia in the groins of otherwise healthy young women.

Findings of gynecologic interest were made in 36 cases (7.2%) of the 500 sterility examinations with tubal passage. Most of these were enlargements of the ovaries and in some cases uterine myomas. Of the abnormal cases 8 also had incipient hernias in the groin regions. A retroflexion of the uterus was

present in 93 cases (18.6%). Pelvigraphy for gynecologic reasons must be considered of minor importance, as the findings in most cases could have been made with a thorough gynecologic examination or with ultrasound. However, in a few cases the findings were of direct clinical value. One case with enlarged ovaries was found to have endometriosis.

Abnormal herniographic findings are enumerated in Table 15. Complete indirect hernias which may be of clinical importance were found in 15 cases (10 on the right side), complete femoral hernias (one bilateral) in 9 cases and obturator hernias in 6 cases of which 2 (Fig. 57) had typical symptoms (Howship-Romberg sign).

Thus, 30 cases had fully developed hernias in the inguinal regions (6%). The remaining hernias enumerated can be considered incipient. The direct hernias were all of the broad-based type with minor or uncertain symptoms. However, they demonstrate that also this type of hernia occurs in women.

Most common of the incipient hernias were inguino-femoral bulgings, 48 cases (9.6%) and incipient femoral hernias, 23 cases (4.3%). The importance of this finding is that they may develop into real femoral hernias.

The syndrome of broad fossa was found in 9 patients (1.8%), 8 on the right side and 6 on the left, 5 were bilateral.

Table 16

Frequency of compression phenomenon in femoral vein in 2 different series of phlebographic test examinations. Percentage in parentheses. Patients in phlebographic test series normal on clinical examination

	No. of patients	No. of patients with total compression of femoral vein			
		Right side	Left side	Bilateral	Total
Clinically normal (Material D)					
Males	545	24 (4.4)	11 (2.0)	25 (4.6)	60 (11.0)
Females	465	9 (1.9)	2 (0.4)	6 (1.3)	17 (3.7)
Total	1 010	33 (3.3)	13 (1.3)	31 (3.1)	77 (7.6)
Herniography					
Males	637	64 (10.0)	49 (7.7)	38 (6.0)	151 (23.7)
Females	259	23 (8.9)	17 (6.6)	14 (5.4)	54 (20.8)
Total	896	87 (9.7)	66 (7.4)	52 (5.8)	205 (22.9)

A pathologic deep pouch of Douglas, extending below the line of the pelvic outlet, was found in 46 cases (9.2%). This rather high frequency is in agreement with the common occurrence of pelvic relaxation in females (FIGGE 1964). Of these patients with enterocele 14 had some kind of hernia in the groins and 4 had also diverticula of the pouch of Douglas. Of 26 cases with diverticula from a normal pouch of Douglas 7 also had abnormalities in the groin. In summary, some kind of hernia in the groins was found in 115 patients (23%). Abnormalities of the pouch of Douglas were found in 72 cases (14.4%) of which 21 were combined with abnormalities in the groins.

Totally 166 patients (33.2%) had some kind of hernia, in most cases incipient only, in the inguinal regions or in the pelvic floor. This is a surprisingly high figure. Admittedly, many of these abnormalities were of minor clinical importance but nevertheless patients with symptoms directed to the groins or the pelvic floor may have advantage of this supplementary examination in connection with HSG.

26. THE PHLEBOGRAPHIC TEST

Before beginning the present herniographic series (1972) a phlebographic test was performed (Material D) in patients with normal legs and no symptoms in the groins. The aim was to obtain information about the frequency of the compression phenomenon of the femoral vein and its clinical significance.

In that series 1010 patients were available for

evaluation. A few patients were excluded for technical reasons or special pathologic findings, such as acute thrombosis with floating thrombus in the femoral vein in 7 patients and post-thrombotic abnormalities in the femoral vein without a history of thrombosis in 11 cases. In all patients the test was performed bilaterally.

In the herniography series of 914 patients the phlebographic test was performed bilaterally in 896 cases (Table 16). The frequency of the compression phenomenon was found to be more than doubled in the herniographic series. It is also more common in males than in females and somewhat more frequent on the right than on the left side. The high correlation between the compression of the femoral vein and the different types of femoral hernia appears in Table 9. In cases with confirmed lipoma within the femoral canal (Figs 6d, 38, 39) compression of the vein was most marked. On the other hand compression is almost never found in young healthy subjects except in active sportsmen. In these it was observed on the right side in 9 of 50 patients (Figs 44c, 49c, Table 11).

A moderate compression of the vein to a diameter smaller than half the normal was frequently found. In the herniographic series this occurred in 420 cases on the right side (46.9%); normal veins were found on this side in 337 cases (37.6%).

Of the cases with total compression in the phlebographic test series 22 patients were later examined by herniography. Of these 16 cases had hernial incompetence in the femoral canal, either femoral or

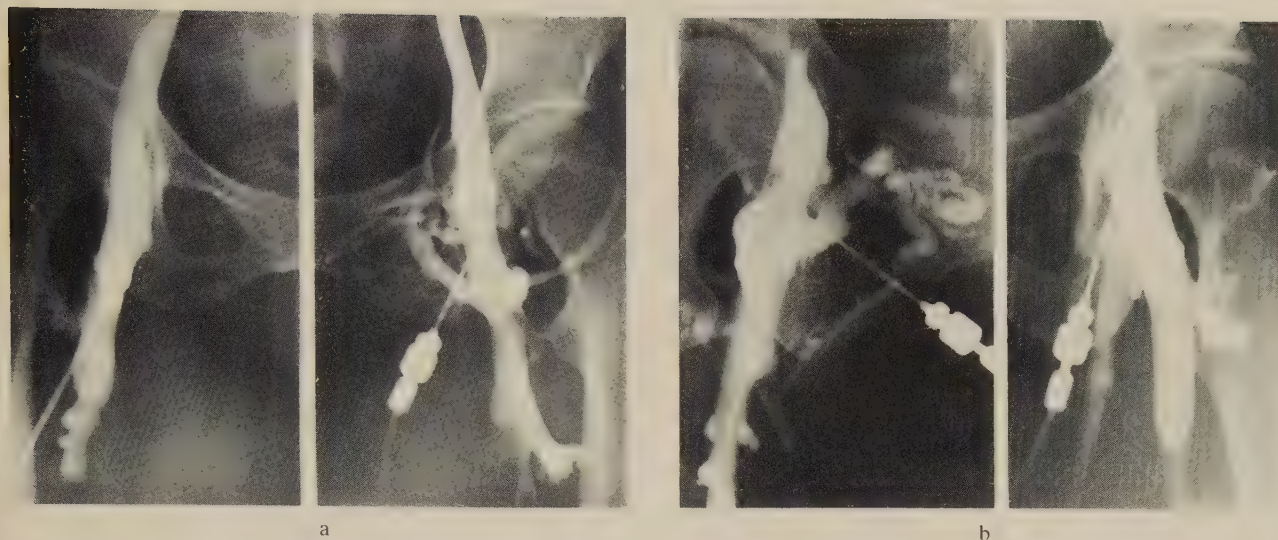


Fig. 87. Incompetence of medial circumflex femoral vein, different stages. a) Woman 32 years (from normal phlebographic test series). On left side filling of moderate dilated veins of medial circumflex system, also some filling of obturator collateral vein in lesser pelvis. Exposure during straining. No compression of

femoral vein. b) Woman 53 years. Inguino-femoral hernias and compression phenomenon bilaterally. On right side, deep varicosity from incompetent medial circumflex femoral vein. On left side incompetence of long saphenous vein.

inguino-femoral hernia (Fig. 88 b). In the remaining 6 patients fat accumulation was seen at the femoral canal (as in Fig. 43 d).

27. SUBINGUINAL DEEP VARICOSITY

This condition means incompetence of the medial circumflex femoral vein, and was observed already in the phlebographic test series (Fig. 87 a). It is a varicose dilatation of ramifications of this vein. In many of these cases the obturator collateral vein is also filled. In the clinically normal cases (Material

D) with these findings there were usually only moderately dilated veins outside the obturator foramen and around the collum femoris (Fig. 87 a). In the herniographic series extensive varicosities were often found (Figs 37 b, 87 b, 88 a).

A special feature of this syndrome is the absence of other valvular incompetence in the proximal veins of the leg, the valves in the long saphenous vein and the femoral vein being as a rule competent. This varicosity is deep-seated and cannot be observed at clinical examination. Symptoms may appear after standing for a long period and consist of a feeling of

Table 17

Frequency of incompetence and varicosity in the medial circumflex femoral vein system. Percentage in parentheses

	No. of patients	No. of patients with circumflex femoral vein incompetence			
		Right side	Left side	Bilateral	Total
Clinically normal (Material D)					
Males	545	20 (3.7)	19 (3.5)	20 (3.7)	59 (10.8)
Females	465	14 (3.0)	13 (2.7)	6 (1.3)	33 (7.1)
Total	1 010	34 (3.4)	32 (3.2)	26 (2.6)	92 (9.1)
Herniography					
Males	637	40 (6.3)	40 (6.3)	24 (3.8)	104 (16.3)
Females	259	10 (3.9)	15 (5.8)	8 (3.1)	33 (12.7)
Total	896	50 (5.6)	55 (6.1)	32 (3.6)	137 (15.3)

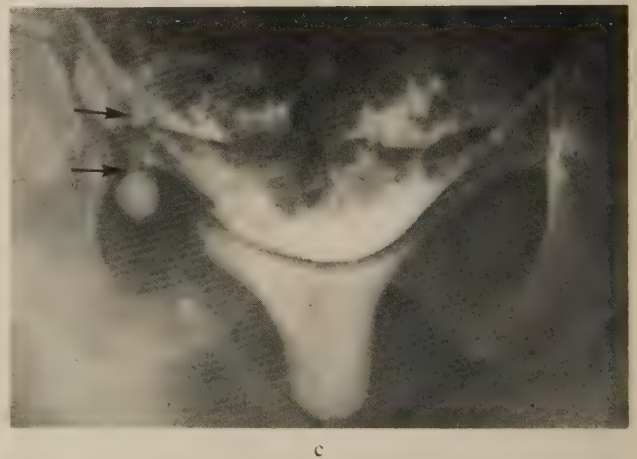
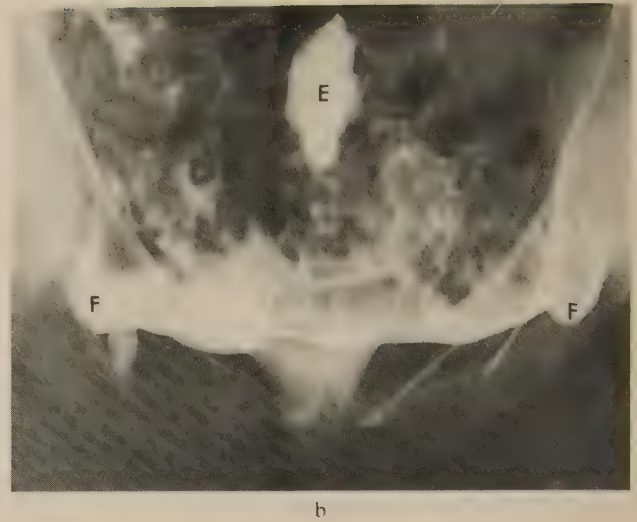
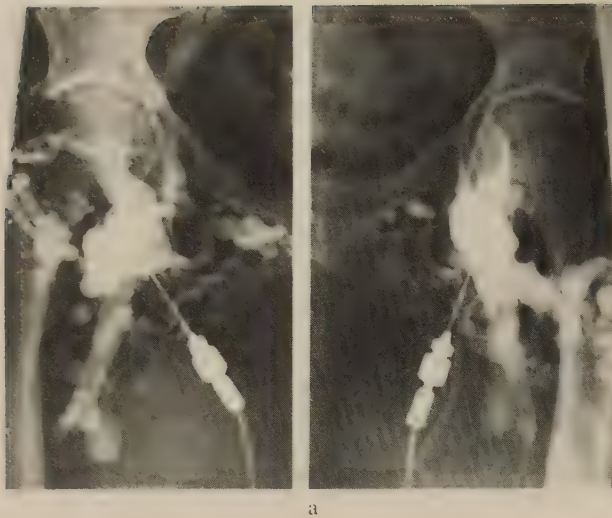


Fig. 88. Multiple hernial changes and 'circumflex' varicosities. Woman 66 years. Patient of slender habitus by loss of weight, pain in groins. Admitted for urography. Because of symptoms injection made as phlebographic test. a) Massive deep varicosity due to incompetent medial circumflex femoral vein bilaterally. Compression phenomenon on straining. Herniography performed immediately after urography. b, c) Inguino-femoral hernial fossae bilaterally (F). On right side, obturator hernia with narrow neck in canal (→). Cystocele below deepened prevesical fossa in midline. Small amount of contrast medium injected into posterior abdominal wall at start of injection (E).

warmth and fullness in the groin. These cases in the two series are listed in Table 17. This syndrome is not as frequent as the compression phenomenon but they are often combined. It was observed in 33 of 139 patients with compression on the right side (23.7%), and on the left side in 23 of 118 (19.5%).

In many cases with this syndrome multiple abnormalities existed due to incompetence in the groins and the pelvic floor. This is illustrated in a case of bilateral inguino-femoral hernias, obturator hernia on the right side, cystocele and a descensus of the prevesical fossa (Fig. 88).

Operative correction or extirpation of these deep varices appears not to have been made. It must be borne in mind that they can be part of the obturator collateral vein, which is a reserve path for the blood from the leg. If the compression phenomenon is also present, this must be first corrected with hernioplasty of the femoral ring in the transversalis layer using Cooper's ligament.

28. AUTOPSY SERIES

In 100 routine autopsy cases (56 males, 44 females) the inner side of the inguinal regions and pelvis were inspected and palpated. Most of the cases were very old and some were emaciated. In 48 cases no hernia in the groins was found. In the 52 cases with abnormalities due to hernia 14 had indirect hernias (3 bilateral). In 10 cases, all males, direct hernias (2 bilateral) were found and femoral hernias in 10 cases (5 females, one bilateral). In 24 cases an evident weakness was palpated in the femoral canal (13 females), of these 7 bilateral. They could be considered incipient femoral hernias. Thus in 34 cases there were signs of femoral hernia. Many cases had multiple hernias of various types.

In 12 cases the sigmoid colon was adherent to the left groin which could not be directly examined. After dissection no obvious weakness in the inguinal wall was found. A tendency to sliding hernia must, nevertheless, be considered in such cases.

In 9 cases localized lipomas were found medial to the femoral vein and in 2 this lipoma was protruding as a fatty tab (Fig. 40 a).

Some of the femoral and direct hernias were of alternate type. The peritoneum could easily be pushed out either into the femoral canal or above the inguinal ligament as a direct hernia.

No case with a true obturator hernia was found. However, in some cases a lipomatous accumulation of fat protruded into the obturator canal, by SINGER et coll. (1955) described as pilot tags.

29. GENERAL DISCUSSION AND CONCLUSION

Herniography is the name given to peritoneography when used for examination of the inguinal regions and the pelvic floor. With this method the inner peritoneal surface is demonstrated. The clinical diagnosis of hernia in the inguinal regions is based on palpation. In cases without a clearly palpable sac the attention is directed to the superficial inguinal ring for evaluation of a possible hernia in the inguinal canal. The classical operative methods are also aimed at direct uncovering of the emergence site of the hernial sac.

In the past two decades new methods have been recommended with an approach from the inner side. At this preperitoneal approach an aspect from the inner side of the hernial regions is obtained which corresponds to that on the herniographic films. The anatomic descriptions given (Chapter 2) are therefore illustrated with schematic drawings of these new preperitoneal hernial repair methods reproduced from surgical textbooks. The peritoneum is a thin and elastic structure and models itself after the next layer, the transversalis fascia and aponeurosis which is the target for the surgical approach. The separate transversalis fascia is in normal cases also a rather thin layer. In the presence of a hernia the sac emerges through defects in the fascia in which fascial condensations and slings surrounding the defect appear. These are used in proper repair according to the new methods.

The herniography both begins and ends with an evaluation of the pouch of Douglas. This is important also to distinguish between perineal hernias and hernias in the inguinal regions. In the principal part of the examination, with the patient in prone position and with the four standard projections, possible

sacs are demonstrated and often filled at the first straining manoeuvre.

The examination preferably begins with the side of the symptoms lowered for better filling. The presence of an open processus vaginallis is searched for as well as a communicating hydrocele. Fully developed indirect hernias will often be better filled after manual reduction in the herniographic position. This type of hernia is described in Chapter 7. Special emphasis should be paid to evaluation of the neck of the sac. Hernias with a narrow neck in the deep inguinal ring may be adequately handled by a simple herniectomy (BROOMÉ 1977, FERGUSON 1978). Hernias with a broad neck of the sac must be operated upon with repair of the deep inguinal ring (Marcy repair, GRIFFITH 1978).

In the diagnosis of direct hernias the lateral umbilical fold is of paramount importance. This fold contains the fibrous rest of the umbilical artery and is anchored in the transversalis fascia. In weakness or rupture of this layer, which is the real origin of all hernias, the umbilical fold is often typically displaced. This fold also seems to have a directive effect on the hernial sacs (Chapter 8). It is often possible to distinguish between separate medial and lateral direct hernias based on their relation to the umbilical fold. In the intermediate type of hernia, the inguino-femoral (Chapter 10), the sac also seems to be directed towards the femoral canal by the lateral umbilical fold. Femoral hernias (Chapter 9) were of primary interest as they can be the cause of the compression phenomenon of the femoral vein. Emerging from behind the inguinal ligament they are the most posterior of hernias in the inguinal region. Thus, they often fill with contrast medium already in the supine position at the beginning of the examination. The phlebographic test may be used as a proof of the diagnosis.

Special causal effects in the development of femoral hernias are described in Chapters 11 and 12. Venous pressure effects and the accumulation of fat in the femoral canal in the stages of development are discussed.

The primary cause of the various hernias is a local weakness or rupture of the inner fascia layer. A general weakness of the same stratum is supposed to be the basis of a herniographic syndrome discussed in Chapter 13. Broad and deep fossae were found in cases with pain in the groin without signs of hernia and were in some cases alleviated after transversal fascia hernioplasty. Medial displacement of the lat-

eral umbilical ligament was a significant indication of this syndrome.

A special series of hernias in young sportsmen is discussed in Chapter 14. Herniography is essentially indicated in cases with obscure symptoms in the groins in these young subjects.

In Chapter 15 sliding hernia is discussed. In spite of there being no peritoneal sac to be filled in these hernias they were found to have a special herniographic appearance also in an early incipient stage without a palpable sac. Correct diagnosis is important in these cases as they easily recur if not properly handled. Most of the hernias of this type in the present series were in fact recurrent.

In Chapter 16 the hernias of the lateral wall of the lesser pelvis are discussed: the obturator hernia and the sciatic hernia, in most cases being accidental findings. A few cases with clinical symptoms (Howship-Romberg) were operated upon and confirmed.

In Chapter 17 an evaluation of incompetence of the pelvic floor and the pouch of Douglas is made. Patients with defecation disturbances are usually examined with defecography. However, direct evaluation of the pouch of Douglas with herniography implies little inconvenience to the patient. Therefore this examination should be considered.

Perineal hernias or diverticula from the pouch of Douglas were accidental findings in most cases (Chapter 18).

Spigelian hernia was not often demonstrated at herniography which therefore is a questionable indication for herniography (cf. SPANGEN 1975). This type of hernia is probably best examined with ultrasound. However, in the inguinal region the various types of hernia cannot be diagnosed exactly with ultrasound, possibly except lipoma.

An important indication for herniography is possible recurrent hernia (Chapter 20). These hernias often had a sac with a narrow neck in a slit-like opening in fibrous scarred tissue which may involve a risk of strangulation. This type of recurrent hernia was also seldom palpable.

The series of herniography in combination with HSG is a frequency analysis of the occurrence of hernia or incompetence of the pelvic floor in young women. The value of pelvigraphy was of minor importance in gynecologic diagnosis, but if the patient had symptoms pointing to the groins or pelvic floor this supplementary examination could be useful.

The phlebographic test of the femoral vein provides valuable information about conditions in the

femoral canal. In pure inguinal hernia the vein was always normal. If the femoral fossa was involved in the protruding of a hernia the vein was more or less compressed in the femoral canal. This compression was most complete in inguino-femoral hernias which have a broad pouching on the medial side of the vein. Accumulation of lipomatous fat in the femoral canal may cause a marked compression of the vein.

A fully adequate evaluation of a herniography often requires a supplementary phlebographic test.

The syndrome of incompetence of the medial circumflex femoral vein was detected in connection with this test and is discussed in Chapter 27. The subinguinal varicosity can only be diagnosed by this phlebographic test. There is reason to believe that this syndrome has clinical importance and it will be the subject of further investigations.

No serious complications occurred in the present series of herniography. One case of rectus muscle hematoma was observed. The examinations were carried out almost entirely on out-patients. Strict sterility and proper puncture technique is imperative.

The frequency of abnormal findings is very high when herniography is performed on patients with local symptoms in the groins, only 25.4 per cent being normal in the inguinal regions. In addition, other hernia abnormalities, incompetence of the pouch of Douglas, hernia in the small pelvis and Spigelian hernia, occurred in 8.6 per cent. Another 5.4 per cent of the otherwise normal cases had some degree of broad and deep fossae as a possible cause of pain in the groins. Totally 88.6 per cent of the patients in the present series had some abnormality found at herniography.

VESTBY & AAKHUS (1966) could produce hiatal hernia in all individuals by using intensive manoeuvres. This is explained by the special anatomic and physiologic conditions at this region. On the other hand, in the bottom and lower anterior boundaries of the abdominal cavity, several prerequisites for hernial abnormalities exist, both congenital and acquired. The herniography is aimed at an exact diagnosis of hernia, if present, also in an early incipient stage. All possible types of hernias in the groins and pelvic floor are properly detected.

30. GENERAL SUMMARY

The diagnosis of hernia in the groins is usually considered sufficient with clinical methods. The

present investigation was undertaken with the aim of analysing which factors are contributing to the strain obstruction syndrome of the femoral vein. Herniography was, however, soon found to be of great value in the hernia diagnosis, giving exact information in clinically obscure and doubtful cases.

A survey is given of previous investigations of herniography. Anatomic and clinical considerations are given with special regard to the new concepts of preperitoneal approach in hernial repair. Puncture method and preferable projections are described. After considering normal herniographic findings in the groins and of the pelvic floor special pathologic findings are described in the following chapters. The classical three types of groin hernia are first discussed. In the most common type, the indirect, the size of the neck of the sac may determine the type of operation. An intermediate type, the inguino-femoral hernia, suggested in the surgical literature is discernible. Presumed causes of femoral hernia, the venous mechanism of Keith and the old lipoma theory of Cloquet are evaluated and typical findings described.

A special sign of weakness of the wall with displacement of the normal boundaries of the fossae is discussed under the name of broad fossa. It was found to be a possible reason for pain in the groins.

Of special interest was the evaluation of a large group of young sportsmen with distressing symptoms of pain in the groins. A large number of abnormalities, obviously the reason for the symptoms, was encountered and confirmed at operation.

The problems of sliding hernia were met with and herniographic diagnosis is shown to be possible with quite typical findings.

Internal hernias in the true pelvis and pelvic floor were often found accidentally. Obturator hernia was a common finding, most often in elderly women and without symptoms. Diagnosis of pelvic floor incompetence is easily made in complete herniography which always should include a lateral view in standing position.

The strain obstruction syndrome was shown to be a true pathologic phenomenon and caused by abnormalities within the femoral canal. The incompetence phenomenon of the medial circumflex femoral vein is another syndrome connected to pathologic conditions in the inguinal regions. The phlebographic test should therefore preferably complete the herniography. Herniography ought to be an established special method in diagnostic radiology.

ACKNOWLEDGEMENTS

I wish to express my thanks and gratitude to:

Professor Erik Boijesen for all his advice, guidance and encouragement in the fulfilment of this work.

Professor Olle Olsson, my teacher and chief advisor for many years. Professor Stig Bengmark, Docent Albert Broomé, Docent Bo Eklöf and Doctor Carl Forssell for special surgical advice.

Colleagues and members at the Roentgen-diagnostic Departments for smooth co-operation and help, Docent Jan Nilsson for experienced support and Mrs Barbro Olsson for secretarial help.

The investigation was supported by grants from Thorsten and Elsa Segerfalk foundation.

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